



FRIDAY, MAY 14, 1897.

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## Contributions.

## Rails for New South Wales.

SIDNEY, N. S. W., April 12.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I read your comments on the call for bids to furnish rails, to be made in the Colony [Railroad Gazette, Feb. 26]. You stated the facts admirably, and the statement has been reprinted in a local paper. With the fall in the price of rails I am urging both in this and the other colonies that, in future, tenders for rails should be called for in America. It is not at all unlikely that fresh proposals will be made for manufacture here. Could not some of your friends be persuaded to pay us a visit? The price with you is now so low that they might transfer a whole plant to Australia. Recollect there is no duty in this colony. If any of your friends authorized me, when opportunity offered, to submit bids for rails or cast-iron pipes I would be glad to do so.

C. E.

## Another Locomotive for Purdue University.

LAFAYETTE, IND., May 6, 1897.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Believing that you will be interested in anything which contributes to the advancement of railroad work at Purdue, I take pleasure in sending you a few lines with reference to a matter which as it seems to me marks a new point of departure in the progress of engineering research.

Purdue University has to-day closed a contract with the Schenectady Locomotive Works for a new locomotive to be used in its engineering laboratory, in connection with courses in railroad engineering. The new locomotive will possess a number of features which are quite new. It will carry a steam pressure of 250 lbs. and will have cylinders so arranged that it may be used as a simple or a compound. The cylinders and saddle will be made up of different castings, and the centers will be so chosen as to allow the use of cylinders up to 30 in. in diameter. Several cylinders will be provided, and these, with a suitable series of bushings, will allow for different cylinder ratios in compound work. The whole machine will thus afford facilities for dealing with conditions quite beyond the limits of present practice.

From its place in the laboratory, the old locomotive, hereafter to be known as "Schenectady No. 1," and which in the course of its six years' sojourn in the laboratory has been run an amount equivalent to 20,000 miles, and has served in an experimental study of many important problems connected with locomotive design, will pass into active service at the head of trains on the road, while the new engine, "Schenectady No. 2," will take its place upon the testing plant.

By the terms of the contract, the present engine, Schenectady No. 1, will be delivered to the Schenectady Locomotive Works within the present month, and the new engine, Schenectady No. 2, will be delivered here early in the fall.

A large amount of data derived from Schenectady No. 1 during the past year will soon be issued from the laboratory, and as soon as practicable all of the papers descriptive of work accomplished in connection with this engine will be published in a single volume.

W. M. F. M. Goss.

## Electric Conduit Roads.

NEW YORK, May 7, 1897.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have read with interest your comments (April 30) on my article, or such portion of it as refers to conduit

electric roads, that appeared in *Cassier's Magazine* for April.

I certainly failed of my purpose if I failed to convey the idea that the underground trolley possesses no advantages over the overhead trolley except from a purely esthetic point of view, while it labors under many disadvantages which the other does not possess. Among these disadvantages are a necessarily greater cost to install, a necessarily greater difficulty in maintaining the same insulation resistance, the almost necessary total blockage of streets in which it is being installed during the period of construction and some others that need not be rehearsed here. It is not claimed, so far as I am aware, by the strongest advocates of the conduit that it possesses any advantages electrically or mechanically peculiar to itself, and the only claim by candid people is that the highest ideal which can be hoped for for the conduit road is that it may prove in all respects equal to the already attained performance of overhead trolley roads.

The double trolley overhead system possesses some advantages over the single trolley, but so many disadvantages, both electrically and mechanically, that electrical engineers the world over have abandoned it in overhead construction. Now these disadvantages do not disappear by burying the wires in a conduit, but are only magnified.

The electrical profession is also almost unanimous that the double trolley must be used if conduit construction is resorted to, and the double trolley is used on the Lenox avenue line, so that on this score, entirely aside from the question of first cost, it is practically the consensus of opinion of the best engineers that the conduit electric railroad, as at present constructed, is inferior to the overhead as at present constructed.

I was perfectly aware at the time of writing the *Cassier's Magazine* article that the generators on the Lenox avenue road had been rewound, and that 500 volts were being used on the 2½ miles of road. But there are many, myself among the number, who regard this use of the higher voltage as still experimental and necessarily so until it has been tested under all conditions of weather over considerably longer distances than those mentioned. I did not know, however, that the drop under present conditions with 36 cars running is only 12½ per cent., nor do you state what those present conditions are. If abundant copper were put in, the drop might be reduced far below this with even most disastrous leakage along the line, and again the drop might be 12½ per cent. in dry weather and 25 per cent. during humid or snowy weather, but assuming fair conditions and the same amount of copper as when but 350 volts between the terminals were used, the drop is less than it should be.

There is another omission which it would be highly interesting to have supplied, viz., a statement of the source of your information that the drop on the Lenox avenue line with 36 cars running is but 12.6 per cent., and that the "Metropolitan Traction Co. has had but three failures, and the leakage is hardly appreciable, even with the conduit filled with snow." It would be interesting to know by what method the insulation resistance of the line was determined and who your authority is for both statements. If your authority is the contractor who installed the road his dictum will scarcely be accepted as entirely disinterested, for the same contractor installed the original Lenox avenue line and maintained, until he was forced by the evidence to admit his inaccuracy, that the system as then installed was a great financial and electrical success. At the time that this contractor was loudest in his claims for the road the *New York Sun* (Aug. 1, 1896) published the following:

"The sentiment in regard to the Lenox avenue system was expressed by President Vreeland, of the Metropolitan Company, yesterday, when he said: If the underground trolley had been built in Sixth or Eighth avenue instead of Lenox avenue, the public and the newspapers would have created such a stir that our lives would have been made utterly miserable. The system is not satisfactory where there is any large amount of traffic. Minor accidents are happening continually, which are unimportant in themselves, but which become very serious indeed when the delays occur which seem to be inevitable in the repairing of the breaks. It is exceedingly difficult to find out where the trouble is when there is any breakdown in the underground trolley. It requires usually from four hours to two days to discover the point of difficulty; and then not more than ten minutes to make things all straight again. This is a condition of things which is not possible in a road which is run for the accommodation of the public. There have been few if any comments on the accidents which have happened in Lenox avenue, because the district through which the line runs is not thickly populated, and the persons who ride in the cars know that the system is in the main experimental. The overhead trolley is different, inasmuch as a break or the cause of any stoppage of traffic may be determined almost immediately, and a repair wagon is at the scene of the accident within five minutes after it occurs. There will be no extension of the underground trolley. Its operation is not certain enough."

It is easily understood that a party who installs a sample plant with the expectation of getting large contracts in the event of its showing satisfactory performance is not a safe party to quote as to that performance.

I must, however, take issue with you when you state that a drop of 12½ per cent. "agrees very closely with accepted engineering theory for overhead trolley construction," and that "it is safe to assume that the transmission loss with the overhead wire would be round to be nearer 25 per cent. than 10 per cent."

I think you will find few engineers who will not say that 12½ per cent. drop on a road so nearly level as is the Lenox avenue road, and so short as that road is, is ex-

cessive; and as to a drop approaching 25 per cent. on a level road of the same length operated by the overhead trolley, I am candid in confessing that I never heard of such a thing, and feel sure that any engineer who would plan a road on such lines would be deserving of a life pension to keep him from ever attempting to construct another road like it.

But supposin' that my figures are too high for the road as at present constructed, you will doubtless admit that the actual figures are considerably higher than they would be if the overhead construction was used. I think also you must admit that the difficulties of insulation are increased by placing the wires underground, and that no advantages except from an esthetic point of view are claimed or can be claimed for the conduit. If you will admit both of these propositions you will admit all that I claimed, and I see no reason for receding from my position.

NELSON W. PERRY, E. M.

[Neither do we see any reason for receding from our position. The matter will receive further attention in our columns.—EDITOR RAILROAD GAZETTE.]

## Condition of the Material of an Old Bridge.

In describing the erection of the draw span of the new Rock Island bridge (before the Western Society of Engineers), Mr. Ralph Modjeski gives some interesting information as to the condition of material taken out of the old draw. This bridge was built in 1872 and was a single-track, highway and railroad bridge, the highway floor being below the railroad deck. The length of the old draw span was 365 ft. 7 in.

A careful examination of some of the main pins, which were all 4 in. in diameter, showed that they were perfectly straight; the only defect was a slight pitting from rust in the spaces between the eye bars, the depth not exceeding in any case ½ in. The pin holes of the eye bars were found perfectly round except in a few cases, where the distortion was evidently due to either careless manufacture or to ramming of pins while disconnecting the old trusses.

The most interesting fact is in connection with the [iron] eye bar heads. The old bridge iron was sold to a rolling mill, where, when it came to cutting up the eye bars for the purpose of rerolling, it was discovered that the heads were frequently crystalline, the body of the bars at some distance from the head being invariably good iron. One of the bars, the only one which at the time of writing this had been carefully watched, when put in the shears showed a crystalline fracture with what might be called facets of very large dimensions. The fracture was entirely crystalline at the head, and as the shears continued to cut every 6 in. or so the fracture gradually presented a less crystalline appearance, until at about 6 ft. from the head the crystals disappeared entirely. This shows conclusively that in this particular case the crystals are not due to the manner in which the piece was broken, as the action of the shears is a perfectly uniform one. I use the word "crystalline" and "crystals" as the best word to express the appearance of the fracture, but I doubt if in this fracture there are any crystals of a definite form.

Mr. E. E. JOHNSON: I presume from the text that no tests were made, but I would like to ask what Mr. Modjeski's judgment is as to the effect of this crystallization upon the strength of material, and, second, what conditions of stress produce the change and what the effect would have been had the old structure been left longer in service.

Mr. RALPH MODJESKI: These questions are very difficult to answer. I have talked with men who have devoted their lives to iron and steel and they cannot account for it. The superintendent of the mills to whom this material was sold seemed to think that this crystallization was produced by vibration and that the reason why the bars showed more crystals at the heads than in the middle was that the waves of vibration were more severe at the head than in the middle of the bar. As to the other question, I acknowledge I am not able to answer it. The eye bars were not tested at the time. The intention was to make a full series of tests, and at some future time I may be able to tell some results. Those bars were watched closely and some of the others were broken up, and, as far as learned, they were all of the same character. They are iron. Steel was not used in bridge building in 1872.

Concerning this old bridge engineer writes to the *Railroad Gazette*: "The statement is rather in definite. For instance, I do not see how shearing could show crystallization, unless the material snapped off in the shears like cast iron. Specimens should have been cut from different positions and tested in a machine, while other pieces should be nicked and slowly broken by bending. If the bars are as stated, they may have been made so by hard hammering till they were cold in forging. It does not appear to me reasonable that the vibrations of the structure would be sufficient to cause crystallization."

Mr. Theodore Cooper says: "There is no mystery about the heads and necks of these eyebars being crystalline to any one who remembers the methods in use at that day and even later for making eye bar heads. To form the head the ends of the bar were heated to nearly or quite a welding heat, and except shaping the head no work of any account was put upon the iron. It was exceptional when the heads and necks, which had been so heated and left without sufficient work, were not crystalline. It was not an unusual experience in these times to have the heads snap off by striking the bars a severe blow in straightening the cold

bars by sledges. Fibrous heads and necks were not obtained with any certainty till the methods of head forming were improved, so that all parts which had been highly heated could be well worked under a suitable hammer before finishing. If tested I should expect these bars to show between 25,000 and 40,000 pounds per square inch ultimate strength, and show crystalline fractures, always at the head or neck. These bars are, in my opinion, as good to-day as when put into the bridge, if they have not been strained above the elastic limit."

#### Railroad Legislation in Wisconsin.

The Legislature of Wisconsin, which recently adjourned, passed ten acts affecting railroads and street railroads.

Chapter 175 authorizes street and electric railroads to acquire real estate and other property necessary for their lines and reasonable station grounds, giving them the right of eminent domain the same as now enjoyed by railroads; but this act gives no authority to lay tracks across steam railroad tracks and does not apply to streets in incorporated cities.

Chapter 182 revises the railroad license law of 1878. This law (section 1,213) now fixes the annual license fee as follows: Roads earning \$3,000 per mile annually, 4 per cent. on gross earnings; those earning 2,500 to 3,000 dollars, 3 1/2 per cent.; those earning 2,000 to 2,500 dollars, 3 per cent.; those earning \$1,500 to \$2,000, five dollars per mile of road and, in addition, 2 1/2 per cent. on all earnings above \$1,500 per mile; on roads earning less than \$1,500 a mile, \$5 per mile of road. On all railroads operated on pile and pontoon or pontoon bridges the tax is 2 per cent.

Chapter 208 amends the law prescribing a penalty for malicious obstruction of track, etc., extending it so as to apply to all railroads, steam, electric or cable.

Chapter 223 provides for taxing street railway and electric companies, the term "electric" including lighting and power companies. Taxation is by license fee based on gross earnings, the same as in the case of standard railroads. Companies must report gross receipts annually in December and shall pay to the City or Town Treasurer, in lieu of all taxes and other license fees, a percentage as follows: Where gross receipts are \$800,000 a year or more, 3 per cent. on the first \$800,000 and 4 per cent. for all above; companies earning less than the sum named pay 1 1/2 per cent. on the first \$250,000 and 2 1/2 per cent. on all above. A road lying in two or more towns shall pay to each in proportion to the mileage of track, but where a city road extends into surrounding towns, three-fourths shall be paid to the city and one-fourth to the towns. (The language of this section is not clear; the intent seems to be to give the city a larger tax per mile than is paid the suburban towns.) The Town Treasurer, receiving payment of taxes under this act, is to pay 9 per cent. of the money to the County Treasurer, and the latter is to pay to the State Treasurer two-thirds of what he receives. Laws conflicting with this are repealed, except chapter 125 of the laws of 1897.

Chapter 232 amends the law providing for the annual publication of a railroad map, authorizing the Railroad Commissioner to publish 17,000 copies of the map instead of 15,000 as heretofore.

Chapter 256 amends Sec. 946, providing for the issue of railroad bonds by towns and cities.

Chapter 294 authorizes any and all railroads to consolidate or otherwise amalgamate with another road whose line can be used with that of the purchasing company to make a continuous main line, the new or consolidated company to enjoy all the rights, including land grants and exemptions from taxation, previously possessed by the old companies. Branches or feeders which can be lawfully connected and operated are also included within the provisions of the act, but nothing in this act shall be construed to legalize any contract heretofore entered into between a Wisconsin corporation and one created by the United States, and there is a proviso that no railroad shall become interested in a parallel or competing line.

Chapter 302 limits passenger fares to three cents a mile on all railroads whose gross receipts are \$3,500 a mile or over.

Chapter 331 revises the law making a penalty for obstructing a track, etc. Where such obstruction causes the death of any person the penalty shall be imprisonment for life.

Chapter 350 directs the Attorney-General, the State Treasurer and the Railroad Commissioner to investigate the accounts of the railroads of the state, "there being reason to believe" from a committee report made in 1893 that some roads do not report their full earnings for taxation. An investigation was ordered in 1895, but no appropriation was made, and the present law re-enacts the resolution of 1895 with an appropriation of \$2,000 for expenses.

We understand that on all the principal roads of the state the passenger fares are already within the limit prescribed in the law just passed, except on the Minneapolis, St. Paul & Sault Ste. Marie, where the rate has been four cents a mile; but that road, by the last report of the Interstate Commerce Commission, had earnings a good deal less than \$3,500 a mile.

The Legislature passed a law taxing sleeping car companies and one taxing express companies, but both were vetoed by the Governor.

#### The Cost of Locomotive Repairs and the Efficiency of Machine Tools in Railroad Shops.\*

The principal items of expense for locomotive service are wages, fuel and repairs. Wages of engineers and firemen do not change, and cannot be changed materially. A report of the Illinois Central Railroad shows that the cost per engine-mile has fallen from 26.52 cents in 1857 to 13.93 cents in 1886, a reduction which has been effected wholly by inventions and improvements in machinery. During this same period the wages of engineers and firemen had risen from 4.51 cents to 5.52 cents per mile run, and while they received only 17 per cent. of the entire cost of locomotive service in 1857, they received 40 per cent. of it in 1886 (see "Recent Economic Changes," by David A. Wells, page 372). This ratio remains the same at the present day.

It is difficult to say from a study of the fuel consumption of railroads whether the consumption of coal per ton mile hauled is any less now than it was 10 or 15 years ago. The indications are that on most roads the difference is slight. During the past few years fuel economy has been quite a prominent item in the effort of railroad master mechanics to reduce expenses, and in some cases an important saving has been accomplished.

The relation of the cost of repairs to wages and fuel is about as follows:

Wages.....	40 per cent.
Fuel.....	30 " "
Locomotive repairs.....	27 " "
Miscellaneous.....	3 " "

100 per cent.

It will be seen that locomotive repairs is almost as large an item of expense to railroads as fuel.

Under the head of "Engine Repairs" are usually charged, in addition to actual labor and materials for repairs to locomotives, such items as tools and machinery, that is, the maintenance in good order of tools and machinery in the locomotive repair shop, and the fuel and supplies for stationary engine connected with it, heating and lighting the shop; the salaries of the master mechanics, foremen, their office men and supplies. A proper proportion of drafting-room and laboratory expenses is also charged. All these additional items form but a small proportion of the total cost, which can, in a general way, be divided into shop labor and material, two-thirds being labor and one-third material. On the C., B. & Q. Railroad the cost of engine repairs for 10 years averages 4.85 cents per mile, and the total cost is near \$800,000 per year. Two-thirds of this, or \$600,000, represents the cost of labor for repairs. The cost of material is largely regulated by commercial considerations, entirely beyond the control of the shop manager. If by careful management and more efficient work, both in the erecting shop and on machine tools, the cost of labor could be reduced 20 per cent., with the same output, it would represent on the C., B. & Q. a saving of \$120,000 per year.

It can be safely stated that in most railroad repair shops in this country the cost of labor in the manufacture of locomotive details and in their repair can be reduced 50 per cent. The principal methods by which this may be accomplished are:

- 1st. By the increased capacity of old tools.
- 2d. By the use of more efficient new tools.
- 3d. By more efficient work on the part of the workmen.

#### Increased Capacity of Old Tools.

Most old tools have light shafts, small gears and small belts. They lack stiffness in general construction, for heavy cuts, but, weak as they are, they have not in many cases been forced to their maximum capacity. The first thing required is a cutting tool of proper quality of steel, with the edge ground to correct shape. It is economical to use the best quality of tool steel, regardless of its cost per pound. Steel of poor quality does not retain its temper, and, when forced to a deep cut, is soon burned or dulled, and when this occurs the return is at once made to a light cut and small output. Having obtained the best grade of tool steel, it should be forged to shapes shown by models or drawings, and the cutting edges correctly formed by automatic tool grinders. In many large locomotive repair shops the lathe and planer tools are still sharpened by hand on a grindstone or emery wheel, and while the workman is doing this the machine stands idle. Tools ground in this way are seldom correctly shaped in the cutting edge and they are not efficient in their work. The steel is rapidly wasted by frequent grinding, and the shape grows worse with each grinding until it is again dressed. The universal tool-grinding machines are now sold so cheaply that every repair shop, having even a moderate outfit of machine tools, could save enough in a few months to pay its cost. The advantages of these machines are:

1st. The tools are more efficient in operation.  
2d. It costs much less to sharpen tools in this way than by hand. In ten hours 350 to 400 tools can be sharpened at a cost of 1/4 of a cent each.

3d. Tools last longer at each forging, because there is no waste in grinding.

4th. The machine tools can thus be kept continuously at work.

For different metals and for different classes of work on the various machine tools a tool can be designed which will be most efficient. Numerous experiments have been made in Germany and France, as well as in this country, to determine the proper angles of the tool edge for cutting metals. Hart's "Werkzeugmaschinen," published in Leipzig in 1870, gives the results of his experiments, and states that the angle between the upper face of the cutter and the plane of the work should be 54 deg. for wrought iron, 55 deg. for cast iron and 66 deg. for gun metal; the angle of relief, that is, between the lower face of the cutter and the work, 3 deg. for wrought iron and gun metal, and 4 deg. for cast iron. He also states that the same angles are best for all depths of cuts. These upper angles are from 5 deg. to 10 deg. less than are commonly used in England, and for heavy cuts used in this country still larger angles are considered advantageous. The greater the angle of the tool edge, the larger the amount of power spent in breaking the shaving in fragments. The smaller this angle is made, the larger is the power spent in friction. In France M. Tresca conducted experiments on cutting tools several years previous to 1880 at the shops of M. Schneider & Co. and at the works of the Paris, Lyons & Mediterranean Railway. He made a scientific study of the cutting action of tools and of the resulting shape of the shaving. The results of his experiments are published in a pamphlet "On the Planing of Metals." He calls attention to an interesting fact, not often noticed, that the unrolled shaving is frequently only one-third or one-half as long as the planed surface. The tool pushes the metal along before it, and it thus acquires an increase in thickness. At the same time shearing takes place

along the whole edge of contact of the tool. Thus we have simultaneously a flow in the direction of the thickness and shearing on the edges.

The third thing to notice is that the substance sheared must escape by gliding on the working surface of the tool, which reacts on it and determines the form of the longitudinal profile of the shaving. The practice of the shops in shaping the cutting edge of tools is in accordance with these different functions; although the details may not have been understood, the forms generally adopted are perfectly rational.

Having a cutting-tool made of good steel and shaped for most efficient work, the depth of cut or the feed should be made as great as possible and equal to the driving capacity of the machine. With old tools, the weak point in the system will soon be found. In many cases it is the belt from the main shaft to the counter shaft which is either too small or too loose, or it may be that the down belt from the counter to the machine is in the same condition. There are few railroad shops where a good system of belting will be found, and a thorough overhauling of it, based on good practice, which has been established by extended experiment and careful observation, would be profitable. In 1884 Mr. F. W. Taylor presented the results of his experiments on belting in the machine shop of the Midvale Steel Company, Philadelphia, which extended over nine years, to 1893. In 1894 Mr. Taylor presented the results of his experiments to the American Society of Mechanical Engineers in a paper "Notes on Belting," in which he gave 36 rules to be observed to obtain the greatest economy and most satisfactory results in the use of belting. Some of the principal data in the paper are as follows:

For maximum economy the speed should be 4,000 to 4,500 ft. per minute.

Average total load for double belting 65 to 73 lbs. per inch of width, or 200 to 225 lbs. per square inch of section.

Effective pulling power, 30 lbs. per inch of width.

The life of belts depends more upon the total load to which they are subjected than upon any other condition.

The life of belts is about doubled by splicing and cementing, instead of lacing or the use of hooks of any kind.

Belts should be thick and narrow.

Belts should be cleaned and dressed every six months.

One of the largest expenses due to defective belts, but one seldom charged to the belt account, is the stoppage of the machine and the interruption to manufacture when belts require repairs in working hours. By proper care and inspection all repairs to belts could be made outside of working hours. It should be remembered that the machine is always doing several times as much as any one man possibly could, and when it stands idle it is equivalent to, say, six or eight men loafing. A foreman will often see a machine tool motionless while the operative is grinding a tool or fixing the belt, and will think it is a necessary condition, while a group of workmen standing idle would immediately attract his attention and suggest a protest. In overhauling the belting in large shops some large belts could be entirely dispensed with by the use of electric motors on detached line shafts, and on large tools direct.

Another point of weakness in an old tool is the feed, which is often not sufficiently strong and rigid to hold the cutter up to the work with a heavy cut. When, by reason of the defects mentioned, the cone or counter is too small for the proper belt, or the feed will not sustain a heavy cut, it will in most cases pay to throw out this old tool and replace it with a good strong modern machine. In the tendency to hold on to antiquated, small, weak, machine tools, the railroad repair shops of this country are carrying on a vast manufacturing industry under the most uneconomical conditions possible.

A mechanical superintendent of a large railroad said at a public meeting (and his remarks are in print): "We cannot afford to put new tools in our shops; the old ones are good enough for repairs." I fail to see the difference in the economy of manufacture, whether the product of the continuous work of lathes, drills, planers, etc., is for repair parts, or for new locomotives. The item of cost is the wages of the man attending the machine, and if on a new machine he could double the product, the cost would be reduced to one-half the original amount. For this reason I should prefer to say that we cannot afford to retain many old tools in service, either on repairs or new equipment. It is certain that individual manufacturers cannot afford to do it. The Schenectady Locomotive Works has thrown out almost its entire equipment of old tools and replaced them with heavy modern machines. The same is true of the Baldwin Locomotive Works and the Pittsburg Locomotive Works.

The reason why railroad companies do not so readily feel and see the importance and necessity of providing efficient machine tools is because to a great extent they do not know the actual cost of repairs in detail. The figure used to indicate the relative cost of locomotive repairs, when any two roads are compared, is cents per engine-mile, and the unit is as deceptive and erroneous for repairs as it is for pounds of fuel burned per engine-mile regardless of the tonnage hauled. On some of the large roads running west from Chicago the cost of locomotive repairs is reported as low as 3 cents per engine-mile and on others as high as 5 and 6 cents per mile. It is evident that the actual cost of the work does not vary so much, and that comparisons of this item on such a basis are useless.

It is likely that it will be difficult to keep the cost of locomotive repairs on a tonnage basis, as has recently been recommended by the American Master Mechanics Association, on account of the continued change of service of many engines from freight to passenger service, and the indefinite value of passenger tonnage, as compared with freight, due to the high speed of the former. While it is possible to keep accounts showing cost of repairs to engines per 1,000 ton miles, yet the difference in condition on any two roads will still make this comparison unsatisfactory. To get at the actual cost of repairs, so as to determine whether the work is being done at as low a cost as it should be done, it will be found best to keep the cost of details at the shop where the best tools are located and where piecework has been established, and then send schedules of such prices to other shops for comparison. . . . On roads where there are one large repair shop and a number of smaller ones, there are certain classes of work not sufficiently numerous to keep an expensive tool constantly employed, and in many such cases the work can be concentrated at the large shop in sufficient quantity to keep the new tools employed and finished material held in stock ready for use in smaller shops. . . .

The proper speeds for cutting tools on lathes and planers have been given by a prominent machine tool builder as follows:

For steel, depending on the hardness... 10 to 16 ft. per minute.

Wrought iron..... 12 to 20 " "

Cast-iron..... 20 to 30 " "

Brass..... 30 to 50 " "

The depth of cut varying from 1/8-in. to 3/8-in., depending on the stiffness of the tool and the size of the work.

If the speed of lathes and planers is near the minimum above given the feed may be much greater than most workmen use. If the machine has sufficient power and rigidity, and the tool is held up solidly to the work,

\*A paper read before the Western Railway Club by Mr. William Forsyth, Mechanical Engineer C., B. & Q. Railroad.

more metal can be removed by a fast feed and slow speed than if the conditions are reversed. Cutting cast iron at 20 ft per minute and feeding  $\frac{1}{16}$  in. will evidently remove more metal than 25 ft. per minute and a feed of only  $\frac{1}{16}$  in. Planer beds should travel forward at least 20 ft. per minute, and in some cases 24 ft. can be used. The return on most old tools is two to one, and sometimes less. This speed can be increased to three to one on large tools and four to one on smaller ones.

#### New Tools.

A number of new machine tools are taking the place of lathes, planers and slotters. The various kinds of monitor or turret lathes now made are so much more efficient than the plain lathes that a saving of from 50 to 80 per cent. can be made in the cost of work, 14 to 16 in. long and  $\frac{1}{2}$  in. to 2 in. in diameter, where three or more plain lathes are used on the same kind of work.

For small brass work, like oil-cups and cab-fixtures,

#### Schenectady Locomotives for the Northern Pacific.

The two accompanying illustrations show a ten-wheel compound passenger locomotive recently built for the Northern Pacific by the Schenectady Locomotive Works. From Fig. 2, which shows the boiler, frames and cylinders, it will be seen that the back head of the boiler is decreased in diameter, being 6 in. smaller than at that section where the dome is placed. All of the flanging on the boiler, as well as the smokebox front and door, cylinder and steam chest casings are of hydraulic pressed steel, while cast steel is used in the wheel centers, foot plates, expansion plates and links, guide yoke knees, rock shafts, crossheads and frame fillings, the object being to reduce the weight of the engine

Diameter and length of side rod crank pin journals. Main pin,  $6\frac{1}{2}$  in.  $\times$   $5\frac{1}{4}$  in., F. & B., 5 in. diameter  $\times$   $4\frac{1}{4}$  in. Engine truck, kind, Four-wheel, swing bolster journal, 6 in. diameter  $\times$  11 in. Diameter of engine truck wheels, 33 in. King of engine truck wheels, Standard, steel-tired, wrought-iron spoke center

#### Boiler.

Style	Extended wagon top
Outside diameter of first ring	62 in.
Working pressure	200 lbs.
Material of barrel and outside of firebox	Carbon steel
Thickness of plates in barrel and outside of firebox	$\frac{5}{16}$ in., $\frac{1}{2}$ in., $\frac{3}{8}$ in., $\frac{7}{16}$ in.
Horizontal seams	Butt joint, sextuple riveted, with welt strip inside
Circumferential seams	Double riveted
Firebox, length	108 $\frac{1}{2}$ in.
" width	11 in.

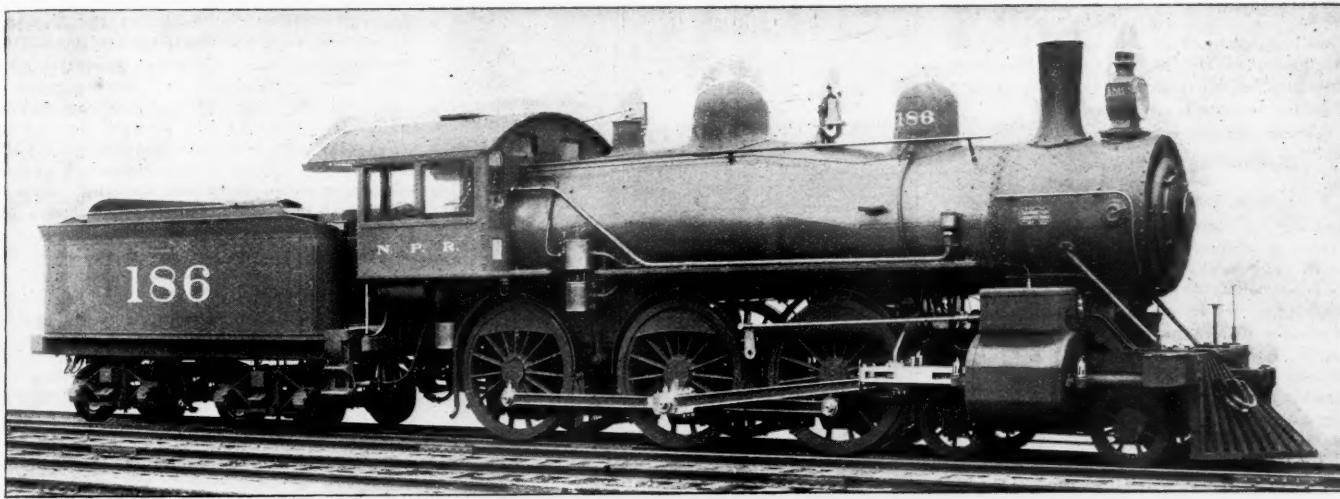


Fig. 1.—Compound, Ten-Wheel, Passenger Engine—Northern Pacific Railway.

Mr. E. M. HERR, Supt. Motive Power.

Built by the SCHENECTADY LOCOMOTIVE WORKS, Schenectady.

the forming monitor lathe is a departure from the old system of turning irregular shapes. In this machine the "under-cut tool slide" is the characteristic feature, and in passing the cutter under the piece it turns it to proper shape and size. The work requiring the tools in the turret is first done, and then the forming tool is fed under, thus completing the piece.

Small boring and turning-mills are adapted to nearly one-half the work done on lathes, and can be done in from one-third to one-half less time and with better finish. These tools are adapted to turning cylinder heads, eccentrics and boring and facing eccentric straps. These turning-mills when arranged with a turret head can save 35 per cent. on the work taken from lathes, 60 per cent. on work from slotters and 20 per cent. from work taken from planers.

Heavy milling machines are now made and guaranteed to finish driving boxes, truck boxes, shoes, wedges, side rods, crossheads and valves for one-half the cost of the work done on a planer. On one of these milling machines four driving boxes are completely finished on straight surfaces in  $2\frac{1}{2}$  hours. A special milling machine for fluted rods cuts the flute full depth at the rate of 2 in. in. per minute. At this rate a main-rod could be completely fluted in  $1\frac{1}{2}$  hours. While I understand that the advantage of milling machines on such work is disputed by some, yet I believe the successful use of them depends more on the operator and the cutters than on the machine itself. If proper cutters cannot be made in the railroad shop they should be bought from concerns which make a specialty of milling cutters. A grinding machine has been recently brought out for milling cutters which is an important adjunct where a number of millers are employed.

Cold-saw cutting machines are now used by all the locomotive builders and by eight or ten railroad companies. These machines are adapted to a large portion of the work of slotting machines and much of the cutting off done by lathes. Their advantage in more rapid work is due to the fact that the cutters on the revolving saw are at work continuously, while the slotter is idle on the return stroke. Cold-saws are used in cutting off square or at an angle, round and square bars, rolled angles, tees, channels and beams and forgings of all kinds. They are especially useful for frog and switch work, they have an automatic and variable feed, and have been built heavy enough to cut steel at the rate of 3 sq. in. of section per minute.

The average price of machine tools, such as are used in railroad shops, has been reduced 25 to 30 per cent. as compared with prices 10 or 15 years ago. At the prices now charged for improved, heavy, strong and efficient tools I believe that one of the most fruitful measures of economy a railroad company can take is to equip its repair-shop with such good new tools as can be regularly employed.

The workman can be improved in his output, almost as much as machine tools have been improved, by making it to his interest to turn out the maximum amount of work possible and paying him in proportion to that amount.

to the lowest possible amount with a maximum heating surface in boiler.

The general specifications of the locomotive are as follows:

#### General Dimensions.

Gage	4 ft. 8 $\frac{1}{4}$ in.
Fuel	Bituminous coal
Weight in working order	155,500 lbs.
" on drivers	112,000 lbs.
Wheel base, driving	14 ft. 10 in.
" rigid	14 ft. 10 in.
" total	25 ft. 10 in.
<i>Cylinders.</i>	
Diameter of cylinder	L. P., 34 in.; H. P., 22 in.
Stroke of piston	26 in.
Horizontal thickness of piston	$5\frac{1}{4}$ in. and $4\frac{1}{2}$ in.
Diameter of pis on rod	$3\frac{1}{4}$ in.
Kind of piston packing	Cast iron rod packing. Jerome metallic

Firebox, depth	F., 76 in., B., 64 in.
" material	Carbon steel
" plates, thickness	$\frac{1}{2}$ in.; back, $\frac{1}{4}$ in.; crown, $\frac{3}{8}$ in.; tube sheet, $\frac{1}{4}$ in.
Firebox, water space	$4\frac{1}{2}$ in. to 5 in. at 24 in. height; front, $3\frac{1}{4}$ in. to 4 in. above grates; sides, $3\frac{1}{4}$ in. to $4\frac{1}{2}$ in. at crown back
Firebox, crown stayings	Radial stayings $1\frac{1}{2}$ in. diameter
" stay bolts	Ulster special iron 1 in. diameter
Tubes, material	Charcoal iron No. 12 W. G.
" number of	314
" diameter	2 in.
" length over tube sheets	14 ft.
Fire-brick, supported on	4 water tubes
Heating surface, tubes	2,288.02 sq. ft.
" " water tubes	28.95 sq. ft.
" " firebox	168.03 sq. ft.
" " total	2,485.00 sq. ft.
Grate surface	30.8 sq. ft.
" style	Rocking, Ry. Co.'s style
Ash pan, style	Hopper, with dampers F. & B.
Exhaust pipes	Single high nozzles. $5\frac{1}{4}$ in., $5\frac{1}{2}$ in. and $5\frac{1}{4}$ in. diameter

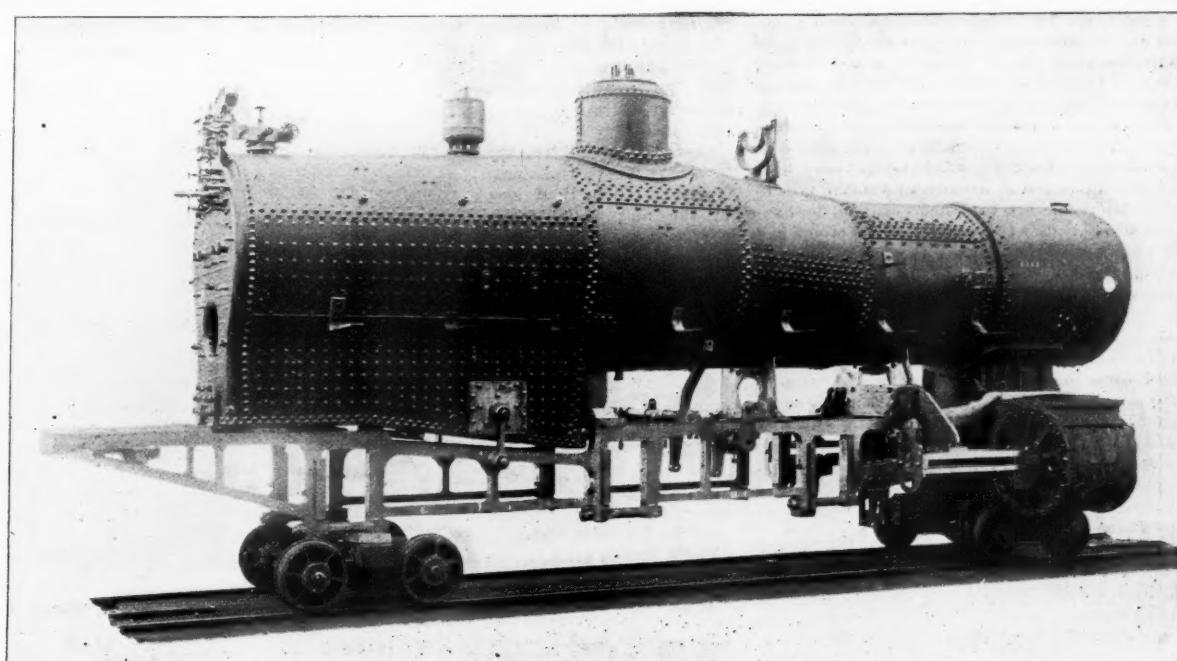


Fig. 2.—Boiler and Frame of Northern Pacific, Schenectady, Ten-Wheel Compound Passenger Locomotive.

Size of steam ports, L. P., 23 in.  $\times$   $2\frac{1}{2}$  in.; H. P., 20 in.  $\times$   $2\frac{1}{2}$  in. " " exhaust ports, L. P., 23 in.  $\times$  3 in.; H. P., 20 in.  $\times$  3 in. " " bridges.

#### Valves.

Kind of valves	Allen-American
Greatest travel of valves	$6\frac{1}{2}$ in.
Outside lap of valves	L. P., 14 in.; H. P., $1\frac{1}{4}$ in.
Inside lap of clearance valves	$1\frac{1}{4}$ in.

#### Wheels, Etc.

Diameter of driving wheels outside of tire	69 in.
Material " centers	Cast steel
Tire held by	Shrinkage
Driving-box material	Cast steel
Diameter and length of driving journals	9 in., on main only, $5\frac{1}{2}$ in. on F. & B., diameter $\times$ 11 in.
" " main crank pin journals (nickel steel pins)	6 in. diameter $\times$ 6 in.

Smokestack, inside diameter, 19 in. at top, 16 in. near bottom " top above rail, 14 ft.  $9\frac{1}{4}$  in.

Boiler supplied by Two injectors, Sellers Improved Class M, No. 9 $\frac{1}{2}$

#### Tender.

Weight, empty	37,800 lbs.
Wheels, number of	8 standard steel tired wrought iron plate center.
" diameter	33 in.
" and length	4 $\frac{1}{2}$ in. diameter $\times$ 8 in.
Tender frame	15 ft. 3 in.
" trucks	10 in. steel channels
Water capacity	4,350 U. S. gal.
Coal	9 (2,000 lb.) tons
Total wheel base of engine and tender	52 ft. 2 in.
" length	61 ft. 4 in.
Engine provided with	Two 3 in. Ashton safety valves

American brake on all drivers, operated by air; Westinghouse aut. air brake on tender and for train,  $\frac{9}{16}$  in. air pump. Westinghouse air signal; Keweenaw River side break seam; Star 16 in. round case headlight; Crosby 6 in. chimes whistle; LeChatelier water brake on cylinders; double riveted mud ring; one McIntosh blow-off cock; Dean's improved sanding device; pressed steel dome ring, boiler front and door, cylinder head covers, steam chest casing top; Spring buffer between engine and tender; Consolidated car heating apparatus with Sewall couplings.

The same builders have also just built a ten-wheel simple passenger locomotive, No. 185, which is a duplicate in every respect of the compound, No. 186, except in the following particulars:

Weight in working order ..... 150,600 lbs.  
Diameter of cylinders ..... 20 in.  
Size of steam port ..... 20 in.  $\times$  2 $\frac{1}{2}$  in.  
" exhaust " ..... 20 in.  $\times$  3 in.  
Greatest travel of valves ..... 6 in.  
Outside lap " " ..... 1 $\frac{1}{2}$  in.  
Inside clearance of valves ..... 5 in. 5 $\frac{1}{4}$  in. and 5 $\frac{1}{2}$  in. dia.  
Exhaust nozzle ..... 5 in. 5 $\frac{1}{4}$  in. and 5 $\frac{1}{2}$  in. dia.

Both of these locomotives were designed by Mr. E. M. Herr, Superintendent of Motive Power of the Northern Pacific, in consultation with the engineering department of the Schenectady Locomotive Works.

#### Railroading in China.

BY R. VAN BERGEN.

It is an anomaly, an absurdity, a country incomprehensible to the most adaptive Caucasian mind, which on the map is designated by the name of China, and which, nominally at least, belongs to the solitary man, dwelling in the Forbidden City known to us as Peking. Here a limited number of ideographic scholars, presenting the brazen front of crass ignorance, pretend to rule a countless people, industrious, thrifty, peaceably disposed, and asking for no greater blessing than not to be oppressed beyond endurance, and even in this they are willing, not only to stretch a point, but to go to the utmost limit. Ignorance, conceit and arrogance, combine in those students of Kong-fu-tse and have created the belief that theirs is the Middle Kingdom, their emperor is the only legal ruler, and that all nations are so many tributary states. Now and again this belief is rudely disturbed. But there is never complete quiet or freedom from disturbance in the heterogeneous conglomeration concentrating in Peking, and, whether the Taiping revolted on the banks of the Yang-tse, or the Japanese opposed the will of the Heavenly Ruler in Cho-sen (Corea), it is all a rebellion to be put down by the mere will of the Boy Emperor in Peking.

It must be destiny that induces us of the Caucasian race to force our civilization upon those hundreds of millions of Mongolians. Every little entering wedge is driven home with sledge hammer blows, and against the apathetic conservatism of the people, and the frantic opposition of the Mandarins, our inventions are forced upon them until — what? There's the rub. Has any one ever considered what will be the result when a rejuvenated race, conscious of its own numerical strength, armed with our knowledge, should resent the masterful spirit displayed by us? What if China should follow in the footsteps of Japan? If she should develop her untold hidden resources, assimilate and apply our modern inventions, and use the immense surplus created by economy to arm herself against us? Well, *après nous le déluge*, and in the meanwhile we might just as well join the scramble in teaching the Chinese how to make railroads.

They have actually made a beginning; and the Mandarins must have been sorely pressed to make this concession to the modern age; for Confucius, who is supposed to be the personification of all human wisdom, fails to make mention of them. It is true that a railroad has been in existence from Tientsin to the Kaiping coal mines, and that this road, during the China-Japan war, did good service in moving coolies (there were no soldiers) to the front. But although it was indeed a railroad, it bore evidence, both in the construction of the road and in its equipment that neither the owners nor the people took any pride in it.

But the flat has gone forth; that new roads must be built. The above-named line (Tientsin-Kaiping) is being prolonged in a northeasterly direction to Shanghai-Kwan, and will follow the Peiho River, northwest to Peking. A trunk line, to connect the capital with Hankow, on the Yang-tse, has also been ordered, and ground was to be broken on March 13 last. For this line 10,000,000 taels have been appropriated, not a great sum considering the length of the road, about 1,400 miles. But the directors are confident of securing the necessary money by loan, a belief created by the presence of parties representing financial syndicates. Here, however, the natural acuteness of the Chinaman will prove wrong, since capital, it may be ever so anxious to find employment, and however eager the competition may be, demands some positive security, and this the Chinese are unwilling to give. There can be but one way of satisfying investors, viz., to place the railroad service under competent and trustworthy European or American management, independent of the corrupt Mandarinate; in other words, to follow the same system as that of the Imperial Maritime Customs, which under Sir Robert Hart has given universal satisfaction (except to the Mandarins, who could not fatten on the spoils), and has maintained China's credit abroad.

Ground has been broken on the above-mentioned lines, as also on the Shanghai-Woosung. This line will continue to Hangchow. This work was to begin on the first week of April, and the officials express confidence that this road will be open for traffic within six months from the time of starting.

In looking over the files of the *Railroad Gazette*, it is evident that that paper has kept its readers fully informed as to what is going on in China, while the details, especially those relating to topography are admirably set forth. But no one save an actual resident of China, can form any idea of the difficulties surrounding those to whom the actual work is entrusted, or of the methods of doing business with the native directors.

To begin with the greatest obstacle is the Chinese circumlocution office. A viceroy thinks that a railroad through a section of his territory would be a good thing. He must first memorialize the Throne, and consent or refusal depends very much upon "what there is in it"

the line from the capital to Hankow has been made by the American engineer, Captain Rich.

It is probably not widely known that railroad shops have been in existence for the past six years at Wu-chang, opposite the large city of Hankow, yet such is the fact. Chang Chih Tung, one of the foremost of Confucian scholars, and comparatively a clean man, was sent especially to Hukuang as viceroy, for the purpose of initiating the work. He at once opened iron and coal mines, and gave large orders for the most improved machinery. A large tract of low land on the west bank of the Han River was selected and filled in so as to be above high-water mark. Appropriate buildings were erected, and a large staff of foreigners was engaged and brought out, and within a year a populous industrial district had arisen as if by magic. A small road was constructed from the banks of the Yang-tse, near Huangchou, to a coal mine in the province of Hupeh, and was highly successful. The war stopped all this, but Chang Chih Tung has resumed his office and work, and was, indeed, the man who pushed Sheng's appointment, having confidence in his ability to carry the work through.

From the above it will be seen that while there is no probability whatever of Americans obtaining concessions for building railroads, and that Senator Washburn's visit will prove as abortive as that of Mr. Wharton Barker, there is, without any doubt, a splendid opportunity for placing American locomotives and other rolling stock, as well as material. The Baldwin Locomotive Works have shown the way. It is not enough to be represented by well and favorably known business houses, although it is necessary to have such agencies for the commercial part of the business. But it is absolutely incumbent to have a competent technical agent on the spot. It is this, the technical knowledge that impresses Chinese officials and renders them easy of approach.

Shanghai, although seemingly at the other side of the world, can be reached from New York in 22 days, and from thence to Tientsin involves only a three-days' journey by steamer. Americans are fortunate in their representatives in China. Hon. Charles Denby, U. S. Minister in Peking, is always ready to assist with advice and, if a party comes with undeniable credentials, will quietly but efficiently use his influence. But it is especially the Hon. T. R. Jernigan, U. S. Consul General in the most important port of Shanghai, who has been active in increasing American commerce. His reports to the State Department deserve richly to be read and studied by every manufacturer who intends engaging in a lucrative commerce; while the protection afforded by him to Americans and American interests cannot be too highly commended. There is no American in China who does not hope and trust that the new administration will continue this official in the position he holds.

#### Damage by the March Floods on the P., C., C. & St. L.

Heavy rains occurred on March 4, causing a rapid rise in the streams, and early on the morning of the 5th damage interrupting traffic occurred on the Cincinnati, the Richmond, the Indianapolis and the Louisville divisions of the Pittsburgh, Cincinnati, Chicago & St. Louis; on the Indianapolis & Vincennes, and on the Cincinnati



Fig. 1.—Flood Damage to Pier of Bridge Over Miami River.

for the Privy Councillors. Venality and corruption prevail in the highest places, and it is only by sharing the spoils that a high official can retain his appointment. One of the most cunning and beyond a question the most corrupt of all Chinese officials, a man who started into prominence as a *protégé* of Li Hung Chang, but who has now attained wealth and influence enough to dispense with his former patron, has succeeded in obtaining the appointment as Inspector General of Railroads, "and," says the *Times* special correspondent, "these qualifications" (his being the cleverest and most unscrupulous man of business his country has so far produced) "perhaps justify the hope that railways will really be built, if he means to build them, but they also justify the fear that they will be built chiefly for the benefit of Sheng Taotai and his powerful allies, whose co-operation he has purchased."

Sheng Taotai or Sheng the Governor, whose real name is Sheng Hsuan Huai, has, in the meanwhile, taken charge of the railroads, and is apparently at least very much in earnest. C. W. Kinder, M. Am. Soc. C. E., is the Engineer-in-Chief on the Shan-hai-kwan-Tien-tsin-Peking Railroad. A pushing, energetic, resourceful man, he is bound to succeed no matter what obstacles are placed in his way. He gave evidence of his pluck and ability when he constructed the first locomotive ever used in the Celestial Empire, and in his administrative genius in keeping the Tientsin-Kaiping line in running order, notwithstanding the insatiable cupidity of his native directors. As a rule, not a contract is given without the Mandarin in charge appropriating a sum commensurate with the amount covered by the contract. Kinder will have none of this, and to cause a Mandarin to forego a well-established prerequisite of his office proves conclusively the value of his services.

It has been definitely decided not to employ any foreign capital in the construction of the roads. The government, as stated before, has appropriated 10,000,000 taels (\$7,000,000) and Sheng is determined to interest the wealthy Canton merchants in his scheme. The latter would cordially respond if the government would decide to build the great trunk line from Canton to Hankow and Peking, beginning simultaneously at the three places mentioned. They are afraid that, if they provide the means for the Peking-Hankow line, not a dollar will remain for the extension to Canton. The survey for



Fig. 2.—Self-Sustained Track of Bridge, No 158—C. & M. V.

& Muskingum Valley, the extent of which is summarized in the following table

Division.	Miles track submerged.	Miles track washed.	Miles track slightly washed.	No. of bridges broken.	No. of bridges slightly damaged.	Miles line down.	Miles wire down.	Time traffic interrupted.	Dys. Hrs.
Cincinnati...	20.29	9.87		3	4	5.0	30.0	7	5
Richmond...	.50	.25		1				2	8
Indianapolis...	1.14	.05	3.00						18
Louisville...	6.00	5.00						3	0
I. & V. R. R.								6	13
C & M. V. Ry.	1.20	3.00		4				7	10
Totals.....	29.13	18.81	8	6.46	14	5.0	30.0		.....

From this table it will appear that there was an aggregate of 29.1 miles of track submerged, of which 18.8 miles were badly washed, and 6.5 miles slightly washed. The damage to the track consisted for the most part of washing out of the ballast and the sweeping of the track off the roadbed, it being in many cases turned upside down.

In all 22 bridges were more or less damaged, in 14 of which, however, the damage was very slight, the girders being merely displaced, but not carried away.

Among the more serious cases of damage to bridges may be mentioned the following:

On Cincinnati Division, bridge over Todd's Fork at Morrow, O., two spans of through iron truss, 102 ft. each. A large sycamore tree brought down by the flood dislodged a highway bridge which stood about 100 ft. further upstream, and carried the wreck against the railroad bridge, sweeping away both spans of the latter, dragging off the upper courses of the east abutment, and shattering the pier badly. This superstructure was badly wrecked. This gap was treasted in the ordinary way as soon as the working forces were able to reach it.

On Cincinnati Division, bridge over the Miami River, near Miamiville, O., consisting of two spans of iron double-track deck of 125 ft. and 135 ft., respectively, and one span of Howe truss of 50 ft. The upstream end of the pier was badly underwashed, causing the end of the pier to break off and settle, leaving the north, or upstream shoe on an overhanging cantilever of masonry. The remaining body of the pier listed to the north, carrying the track 20.5 inches out of line and 8.5 inches out of level at the upstream side. The emergency work done at this point was as follows:

(1). The overhanging masonry was wedged up, so as to take support upon that part which had broken away.

(2). A trestle bent was put in under the first panel point of the truss at each side of the pier, and the trusses supported at the hip joint of the top chord.

(3). A bent of trestle was then placed on each side of the pier and as close to it as practicable, leaving working room between for the subsequent reconstruction of the pier. These bents were 18 ft. apart.

(4). Girders consisting of top chords from the former channel span of the Newport & Cincinnati Bridge (which was recently dismantled in the course of reconstruction of the bridge) were then placed transversely with the pier on these trestles supporting the end shoes. The bridge was then jacked up into line and surface, and traffic resumed.

In selecting these top chord pieces for the cross-girders, their strength was calculated and found not quite sufficient under the conditions of loading. The end shoes were 5 ft. apart, c. to c., and the girders would, therefore, be loaded at two points 6 ft. 6 in. from the supports. If this distance from load point to support could be reduced to one-half this amount, the girders would have ample strength. This was accomplished by using two pieces, one above the other, the upper one being supported on the lower one by blocking 3 ft. 3 in. from the end.

In the illustration, Fig. 1, made from a photograph sent to us by Mr. T. H. Johnson, Chief Engineer of the road (to whom we are indebted also for the information) the general character of the damage to the pier and of the trestles put in are clearly shown. One cross-girder appears resting on the trestle, but not yet moved into place under the shoe.

On the Cincinnati & Muskingum Valley, Bridge No. 157 consisted of two spans of plate girder deck bridge, with seven spans of trestle approach at one end. The trestle approach was undermined, but not carried away. Bents were straightened up and underpinned so as to make the track safe. Bridge No. 158 consisted of two spans of Howe truss deck bridge of 88 ft. 6 in. and 93 ft., with trestle approaches. The west truss span and the west trestle approach were carried out, leaving the track suspended in the air for a clear length of 150 ft. See Fig. 2. The workmen passed and re-passed over this suspended track while putting in the work. The east span, while not carried away, was moved partly off the pier, but was replaced in position without difficulty. This gap was closed by framed trestle of the ordinary type. The damage to this bridge was done by the same sycamore tree before referred to.

Bridge No. 159 was Howe truss, deck, with "T" abutments. The bridge seat of the west abutment was undermined and broke off in line with the face of the "T" wall. The truss was saved by suspending it to the "T" wall by block and tackle, as shown in Fig. 3. This was done when it was discovered that the abutment was undermined, but before it had entirely gone out.



Fig. 3.—Bridge No. 159, C. & M. V., Suspended at One End.

Bridge No. 163, also a Howe truss bridge, of two spans, was in process of being replaced with an iron bridge, and falseworks were in place, but the old bridge had not been dismantled. The falseworks were carried out, and some damage done to the masonry of the west abutment.

On the Richmond Division, Bridge No. 26, near Read-  
ing, O., carried the track of the P. C., C. & St. L. over  
that of the Cleveland, Cincinnati, Chicago & St. Louis.  
The water rose to an unprecedented height, flooding the  
"Big Four" track and flowing through this bridge  
opening with a strong current. The material at this  
point is of sand and gravel formation, which yielded  
readily to the force of the current, resulting in the  
undermining of both abutments, one of which toppled  
over, throwing the superstructure down upon the track  
of the "Big Four." The other abutment was left stand-  
ing, but so badly disturbed as to be practically  
destroyed. The superstructure was a plate girder  
through bridge. It was removed from the position  
shown in the cut, Fig. 4, without being taken apart, and  
was found to be only slightly injured. The debris being  
cleared away, the gap was closed with trestle work of  
the ordinary type.

#### Electric Lighting from the Axle.

In our issue of June 8, 1894, we described the American Railway Electric Light Co.'s system of lighting cars by

electricity generated direct from the axle, as applied to a Pullman car. Since that time a number of changes in the mechanism have been made, and the new system has been applied to the Pullman parlor car Mabel, making regular trips between Jersey City and Philadelphia, Atlantic City and Washington on the Pennsylvania Railroad. Up to the present time the car has traveled 3,668 miles.

On Thursday evening of last week the officers and stockholders of the company and a number of guests made a special trip in the car to New Brunswick, N. J., when the action of the new system was shown. The principal changes are, doing away with a special axle and the addition of automatic mechanism for regulating the current. The motor can now be clamped to one of the ordinary axles of a car by means of a split sleeve and is suspended from the truck frame by a heavy spring to take up vibration. No belt is used, the armature being geared direct to the axle.

The car Mabel has 28, 16-c. p., 60-volt incandescent lamps, requiring 28 amperes. By a special automatic device 40 amperes are generated while the lamps are burning and but 25 amperes when not in use. Connected with the motor is a 32-cell 250-ampere Syracuse storage battery, which stores the surplus energy for use when the car is not in motion. Until the car reaches a speed of 20 miles an hour the armature revolves without generating any current. When that speed is reached an automatic switch throws the generator into action.

The horse-power required to operate the motor is estimated as about  $\frac{3}{4}$ . The dynamo is automatically oiled and the whole apparatus is encased for protection against dirt and water.

The first equipment, applied to the Mabel, and used for experimental purposes, was built for 18 lamps, and ran more than 20,000 miles with 28, the motor finally burning out.

The officers of the new company are: President and General Manager, Wilbur Huntington, and Secretary, G. L. Watson.

#### Foreign Railroad Notes.

During the fiscal year ending with March, 1896, 822 miles of new railroad were opened in India, making a total of 19,677 miles.

The Cuban Railroad Gazette announces that the railroads of the island have been authorized to increase their rates 20 per cent. during the war.

The Royal Portuguese Railroad Company has recently built two locomotives for mixed trains which are said to be the first locomotives ever built in Portugal. Only the wheels and the cylinders were imported. The engines have six drivers of  $51\frac{1}{2}$  in. diameter and weigh 88,600 lbs. They are so satisfactory that the company purposes building seven more like them this year.

In introducing the 24 o'clock system on the Belgian railroads, care has been taken in designating midnight, which will be either 0 or 24 o'clock. If a train leaves a station exactly at midnight, the time-tables will say it leaves at 0 o'clock; but if it arrives exactly at midnight, it arrives at 24 o'clock. The railroad clocks will have their faces changed only by putting "13" just under "1," etc., making an interior concentric circle.



Fig. 4.—Washout at Bridge No. 26, Richmond Division, P., C., C. & St. L.



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EDITORIAL ANNOUNCEMENTS.

**Contributions.**—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

**Advertisements.**—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns our own opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

We give a good deal of space in this issue to a paper by Mr. William Forsyth on "The Cost of Locomotive Repairs." We have nothing to add now to the excellent investigation which he has made of this important subject, but we advise railroad officers, not only officers of the mechanical departments, but general officers, to read carefully and consider this paper. It is full of information and of sound suggestion, being as it is, the fruit of years of experience and of careful and intelligent observation.

Florida has passed a railroad law, and we give its main points on another page. In spirit it is as radically populistic as that of South Dakota, published in these columns two weeks ago, and our criticisms on that law will apply to this, though Florida prescribes no absolute limit upon rates. The bill has been drawn up with much less intelligence, but the backwoods legislator has no trouble in expressing his essential meaning, whether he has a grammarian to draft his laws or is compelled to do the job himself. We have an example of this in Section 15 of this law, which attempts to prevent the railroad from correcting errors in billing where the shipping agent has named too low a rate. This section also makes a railroad responsible for the safety of goods after they have passed beyond its own line. The Florida legislators mean to be right up to date, and have inserted in their law a provision, with the necessary exemption from prosecution, compelling witnesses to testify against themselves, and the Railroad Commissioners are to make not only rates, but time tables, if they see fit. Probably they will not be directed to design the locomotives and bridges until after the legislature has tried its own hand at this department of railroad work. The law has the usual clauses ostensibly insuring fairness, hearings being made compulsory and 30-day notices being required; but, of course, the real issue as regards fairness depends wholly upon the knowledge and temper of the Commissioners, and this is an unknown quantity as yet. There are at least 100 men in the state who ought not to be appointed to commissionerships; for, according to the press despatches, that number of applications has already been received by the Governor. Why not appropriate \$250,000 to pay these 100 idle men \$2,500 a year to stay at home?

**The Railroads, the Supreme Court and Congress.**

The Supreme Court has refused to rehear the case of Trans-Missouri Freight Association. This must be taken as a reaffirmation of the opinion that every contract in restraint of competition is illegal, no matter how beneficial to the public it may be. To the lay mind this rather weakens the hope that the Court, in its decision on the Joint Traffic Association case next autumn, will contrive to modify its anti-trust decision, for to the ordinary comprehension there is no rational way, consistent with legal precedents, by which such modification can be made.

Meantime, the course of events in Congress gives no hope of any change in the law before the regular session next winter; but it is probable that

Senators and members are giving more practical consideration to the railroad problem than in former years. Mr. George R. Blanchard, who has in the past done much to enlighten Congressmen on transportation economy, has this week published a letter showing some of the inconsistencies of our theories of governmental regulation of railroads. He compares the government finances with those of the railroads of the country, and estimates that during the three years that the national revenues have shrunk \$188,000,000, the defaults on railroad bonds have equalled about the same amount. Continuing, he says:

"The government pays uniform compensation for the carriage of its mails, and stipulated prices for the transportation of its troops and supplies, and it does not plead that 'competition' is lessened, 'trade restrained,' or its expenses are increased because it does not receive concealed rebates from those charges. If governmental officers accepted them they would be dismissed. Nor do its officers say that as the rates they ask for are for the government they will exercise its power to compel open or secret cut rates, or that they will divert their large business if railways do not concede for the state some or all of the irregular things done under private guises called 'competition.' As the government is the largest patron of the railways, its legal aid should be given to put and keep all other patrons upon the same honorable plane on which it conducts its own business with the same carriers.

"If the United States purchased the railways they would continue to so act as to their own traffic, and would fix and enforce against all others the transportation charges found reasonable and made public. Conferences among parallel governmental lines would also be as essential then as now, to decide and announce their intricate rates, and the changes in them required by law, by new and controlling trade conditions and by legitimate competitive forces.

"If government purchased only the Union Pacific Railway under the pending foreclosure, it could only announce its rates upon the large competitive traffic of that great system after the conferences and the methods which that company now avails of. With all its power, government could not maintain independent rates on that one line and secure traffic for it unless its private competitors made the same rates and maintained them with equal honor and inflexibility.

"If the government controlled both the railway and customs charges, it would inflexibly and uniformly charge and retain both schedules as published. There would be no other justifiable governmental course, and it is equally just when the railways collect one of those charges. If, on the other hand, it is better that only the transportation element of commerce be capricious, concealed and preferential, because that condition is a desirable requisite of so-called 'competition,' should not rival customs collectors also make different import charges at their competing ports of entry?"

Mr. Blanchard goes on to argue that if transportation is a delegated governmental function, railroads are entitled to a reasonable delegation of power to maintain stability of rates. Suppose the government had owned the railroads during the past three years; it would have had to tax the people to meet the deficits and that would have been more inequitable than to let the burden bear upon the actual users of the railroads.

**The Nicaragua Canal in Congress.**

In the sundry civil bill as it passed the Senate some very significant changes were made in the item providing for continuing the surveys on the Nicaragua Canal. As the bill passed the House it contained the following words: "And to carry out this purpose, the President of the United States is authorized to appoint a commission to consist of one engineer from the Corps of Engineers of the United States Army, one engineer from the engineers of the Navy and one engineer from civil life." In the Senate this clause was changed to read: "And to carry out this purpose, the President of the United States is authorized to appoint, by and with the advice and consent of the Senate, a commission to consist of one engineer from the Corps of Engineers of the United States Army, one officer of the Navy, who may be taken from the active or retired lists, and one engineer from civil life."

The significance of the changes in the Senate is apparent when one reads carefully the words and studies the debate and knows something of the history of the past. The influences which have so long dominated the Senate in this matter, against the real interests of the canal and of the country, are apparent. Various efforts were made in the Senate to modify this provision, so, for instance, as to enlarge it to five members and to make it discretionary with the President as to whether any officer should be appointed from the Army and Navy, etc. All of these were voted down and it will be observed that the requirement that the appointee from the Navy should be an engineer was struck out and that the Army and Navy members can be drawn from the retired lists.

As we read the amended clause and the debate we discover the meaning of the change. Obviously, it is the purpose of the friends of the old company to prevent, if possible, the selection of Colonel Ludlow and Mr. Endicott. Opening the retired list to this appointment makes it possible to send to Nicaragua an officer of the Engineer Corps of the Army known to have been friendly to the old company and physically unfit for the labors of the examination. Striking out

the word "engineer" in the case of the Navy makes it possible to send a line officer known to be friendly to the old company and entirely incompetent to make a critical examination of the ground and of the great physical questions involved. Making the appointments subject to the approval of the Senate makes it possible to block the selection of three men so able, so energetic and so patriotic as the gentlemen who made up the last Board and whose able and fearless report stopped the progress of one of the most audacious bunco games that has ever been brought before Congress.

It is quite evident that those who wish to save the country from the consequences of foolish action in this Nicaragua Canal matter must still be vigilant. It is another case of what we see constantly in politics—on one side is a group of men who have great money interests at stake; on the other side are men who have only the public good as a motive power. Obviously, persistence and vigilance and unremitting activity are most likely to be found with those whose personal interests are involved and the danger is that the other party will get tired or careless.

**The New Experimental Locomotive for Purdue University.**

The information that a contract had been signed by the authorities of Purdue University and the Schenectady Locomotive Works for a new experimental locomotive, to be known as "Schenectady No. 2," reached us last week after we had gone to press. In another column of this issue we publish a letter from Prof. W. F. M. Goss, which describes in a general way the new locomotive which will have a boiler capable of carrying a steam pressure of 250 lbs. per square inch and which will be so arranged that the cylinders can be detached from the saddle casting, thus permitting the use of cylinders of various dimensions. We understand that the new engine will have all the improvements which have recently been applied to modern American locomotives.

The engine "Schenectady No. 1," now at the Purdue testing plant, was described in a paper on "A Laboratory Locomotive," presented by Professor Goss at the San Francisco meeting of the American Society of Mechanical Engineers in May, 1892, and given in the *Railroad Gazette* May 20 of the same year. This engine was ordered of the Schenectady Locomotive Works in May, 1891, and was built from a design made in December, 1887. It carries a working steam pressure of 140 pounds per square inch.

The work done on the testing plant at Purdue University has been set forth in various papers and reports presented by Professor Goss before the engineering associations and railroad clubs, and the following will give an idea of the scope of the work performed with the first engine.

The results of the tests made during 1892 and 1893 were given in two papers, one of which was an article in the *Railroad Gazette*, Oct. 7, 1892, which showed especially the relation existing between the steam consumption and various points of cut-off. The second paper was read before Division B of the Engineering Congress at the World's Fair and gave the results of 20 tests made under different conditions as to drawbar load, speed and cut-off. An abstract of this paper appeared in the *Railroad Gazette*, of Aug. 25, 1893. The results of numerous experiments showing the effect of the locomotive counterbalance were presented in a paper before the American Society of Mechanical Engineers, December, 1894.

On Jan. 28, 1894, the mechanical laboratory in which the locomotive was installed was destroyed by fire, but by Sept. 14 of the same year a new testing plant was ready for operation, and the locomotive "Schenectady No. 1" had been overhauled and repaired at the Indianapolis shops of the Pittsburgh, Cincinnati, Chicago & St. Louis. Quite a large amount of data which had been collected but not published was lost at the time of the fire; it was therefore necessary to repeat many of these tests.

The results of the experiments which have been conducted since the rebuilding of the laboratory form the substance of a number of recent papers by Professor Goss. One of these describes the effect of high rates of combustion upon the efficiency of locomotive boilers, and was read before the New York Railroad Club and given in the *Railroad Gazette* Sept. 18, 1896. Another paper, presented before the Western Railway Club in May, 1896, treated especially of the maximum power developed by the locomotive as demonstrated by experiments at Purdue University; also the relations between the power and speed, and between power and cut-off, and the steam and water consumption at different speeds and cut-offs. An abstract of this paper will be found in our issue of June 5, 1896.

Other work which has been done on this plant is the determination of the effect of long and short in-

icator pipe connections and the extensive series of experiments conducted in connection with the Committee of the American Railway Master Mechanics' Association to determine the proper design and size of exhaust pipes and nozzles. The results of these tests are given in the report of the Master Mechanics' Association for 1896 and in the *Railroad Gazette* July 3, 1896.

It will be seen what a variety of subjects has already been investigated. But so many important changes have been made in the design of locomotives within the past ten years that it is impossible to obtain with an engine such as "Schenectady No. 1" many of the conditions now commonly existing in the best locomotive practice. These conditions have followed an increase in steam pressure, weight and the size of the working parts, in addition to many radical changes in the design. It is gratifying to know that very soon the Purdue testing plant will be provided with facilities for obtaining exact data concerning many points upon which there is, at the present time, little or no reliable information.

With the wide range of steam pressures which will be available with "Schenectady No. 2" the effect on the economy of the engine due to increasing the pressure can be studied, and the point of maximum economy can probably be observed both when working as a single expansion and as a compound engine. The many important problems connected with the action of the valves, valve motion and lubrication with high pressures can also be investigated with a possibility of obtaining some valuable information.

Probably the most important feature of the new engine is that it can be worked as a simple engine with cylinders of various diameters, or as a compound engine in which the diameter of cylinders and the cylinder ratio can be varied. Much data is needed at this time on the proper cylinder ratio for compound locomotives, and also exact data is desirable regarding the economy resulting from varying the sizes of the cylinders of simple engines.

The opportunity of making with the new engine a direct comparison of the relative value of the simple and compound locomotive is undoubtedly the best which has so far been offered and the results obtained will go a long way toward clearing up this very troublesome question. So much good work has been done on the Purdue testing plant that with its new equipment it should possess an added interest for railroad men who ought to give their best support and encouragement to institutions willing to undertake such work.

#### Annual Reports.

*Southern Pacific Co.*—The Southern Pacific reports now for the year ending December 31, 1896, although the fiscal year of the company has been changed to June 30. This preliminary report is, however, very full. The total miles operated were 7,389. The main results were:

		Dec. per cent.
Gross earnings.....	\$48,666,667	\$1,790,358
Operating expenses....	31,962,207	1,280,229
Net earnings.....	\$16,704,460	\$510,129
Total income.....	18,934,105	657,370
Charges to income ...	\$17,144,551	\$231,701
Surplus.....	1,789,554	395,669

It will be observed that while gross earnings fell off 3.68 per cent., the operating expenses were reduced even more, so that the net loss was only 2.96 per cent. The total passenger earnings amounted to \$11,979,580, or 25 per cent. of the earnings of the system and the decrease in these was but 0.36 per cent. The mail earnings, which were about \$1,476,000, actually increased slightly. The freight earnings were \$29,912,802 or 61 per cent. of the whole and these diminished 5 per cent. as compared with the year before. The number of passengers carried increased about 2 per cent. and the passenger miles increased in about the same ratio, aggregating 605,701,668. The receipts per passenger mile were 1.978 cents; they decreased on the Pacific system and increased on the Atlantic system, the result being an increase of 0.044 cent in the aggregate. The greatest loss in earnings was, as we have seen, in freight. The ton-miles fell off 2.7 per cent., but the total reached the enormous aggregate of 2,538,607,799. The average rate was 1.178 cents per ton-mile.

The decrease in operating expenses went through all the items except general expenses, which were increased. In maintenance of way, the operating expenses were 8 per cent. less than in the preceding year. In maintenance of equipment, the decrease was 4 1/2 per cent., and in conducting transportation nearly 3 per cent. Considerable part of the reduction in transportation expenses was due to care in loading cars. On the Pacific system, for instance, while the tons handled fell off only 0.64 per cent. and the ton-miles 3.42 per cent., the revenue train mileage fell off 12.39 per cent. The decline there in loaded car miles was 8.08 per cent., and in empty car miles 15.02. On the Atlantic properties there was a reduction of 6.31 per cent. in tonnage and 7.45 per cent. in car-miles.

The average train load is given in two ways; first, based on the mileage of revenue trains and, second, based on total freight train mileage. The heaviest average load on the revenue train basis is on the Pacific sys-

tem, which amounts to 236.91 tons per train, but on the basis of total mileage the average load is 185.68 tons. On the Atlantic properties the average load of revenue trains was 211.51, and on the basis of total mileage it was 205.14 tons. On the Houston & Texas Central lines the average train load was about 174 tons. The reasons for estimating the train loads both ways are stated in the report. In one case the train mileage includes simply trains carrying regular train crews; in the other it includes miles run by helping engines and locomotives running light. The company has always used the total locomotive mileage as the unit. The light mileage is an important part of the total on the Pacific system because of the heavy grades. In order to control and minimize this mileage as far as expedient, by reducing grades and by the use of heavier locomotives and by closer attention to loading cars, the total mileage is used in making up the average tons per train.

In the general remarks of the President, which are important and interesting, he speaks of his gratification at observing the excellent physical condition of the properties on a recent trip. A table is presented showing a comparison of traffic and rates as between 1885 and 1896. The reduction in passenger rates was 20.28 per cent. and in freight rates 44.23; or stated in another way, the properties have given to the public in the time noted an increase of 25.95 per cent. in passenger service, with an increase in gross earnings of less than one half of one per cent. and an increase of 88.62 per cent. in freight service, with an increase in gross earnings of a little over 5 per cent. The exceptionally large reduction in rates within this short period is attributed in some degree to the saving from consolidating a number of smaller lines, by which the service to the public was improved and expenses reduced.

Mr. Huntington notes a favorable change in public opinion toward the railroads and corporate interests in general. He thinks he discovers that the mutuality of interests is becoming better understood by the public and by the officers of the public. He believes that the trend of public opinion is unmistakably in favor of uniformity of rates and that altogether there is a marked improvement in the public mind toward the transportation interests. We thought so too a year ago, but the last 12 months have made us again doubtful as to any important improvement in this respect.

In one of Mr. Huntington's positions we can, however, agree with him thoroughly. He says: "However bad the laws may be, they have, I believe, never damaged the railroad properties of this country as much as did the people who owned them by their want of faith with each other and disregard of engagements with each other, no matter how sacred their character may have been." We are glad to have this said on the authority of the president of a great railroad system. We have repeatedly said it and have long believed it. The salvation of the railroad properties of the country rests more with the officers who administer those properties than with the makers of the laws. It is just as absurd to run to Congress to get laws to help manage railroad properties as it is to try to get laws which will help to make people rich in manufactures or in any other calling: it is all a part and parcel of one vicious principle. To be sure it does not follow from this that the railroads ought to stop trying to have the anti-pooling clause abolished from the Interstate Commerce law. That effort is working toward less legislation instead of toward more. In brief, one of the great difficulties of the situation is, and long has been, that the efforts of the honorable to control the dishonorable are defeated by the laws. It is Mr. Huntington's opinion that the limit of the downward tendency of rates has been reached if the owners of the railroads and their managers can agree to maintain reasonable and just rates, but to what extent such agreement can be kept "remains to be seen."

*Chicago & West Michigan.*—The Chicago & West Michigan reports for the year ending Dec. 31, 1896. The miles operated are 581, of which about 93 are worked under lease. The gross earnings in 1896 amounted \$1,642,617, having decreased \$81,430 from the previous year. The working expenses and taxes were \$1,321,476; decrease, \$82,621. The per cent. of expenses and taxes to earnings was 80.44, which, it will be seen, is far above the average. The Board, in its report, says that this large percentage "is due entirely to the small earnings, as a large increase in traffic could be handled with only a slight increase in expenses." The net earnings were \$321,141, having increased about \$1,200. A small sum was received from interest, and the sum of \$408,364 was paid for interest on bonds and coupon scrip, an increase of \$7,836 over the previous year. After paying interest there was a deficit of \$55,727, being only a few hundred dollars above that of the preceding year.

This line, lying out of the east and west thoroughfare,

is dependent entirely on local support, and consequently suffers severely from the depression in business. This is true not only of freight, but of passenger business.

The ton miles in 1896 were 6,000,000 more than in the previous year, amounting to 92,595,000. The average haul was longer, but the rate was less, namely: 1.073 cents,

as compared with 1.194. Since 1888 the freight rate has fallen from 1.675 cents. The passenger-miles were 2 1/2 millions less than in the previous year, namely, 24,972,000. The rate was slightly greater, being 2.141 cents against 2.119.

Some improvements have been made during the year notwithstanding the hard times. Forty-eight wooden culverts have been replaced with iron pipe and several

new ones have been built or extended. The total of iron pipe used for this work was about 1,500 ft. Iron surface cattle guards were put in to the number of 95, of which 68 replaced old wooden guards and 18 worn-out iron guards. Small repairs were made to a number of bridges and one new one was built. As for the future it is said that 40 miles of standard fence will be required, that 50 stock cars are needed and that the old wooden bridge over the Grand River at Grand Rapids is liable to give out at any time. The plan for a car ferry, while still under consideration, has not been adopted, as conditions are not yet favorable.

#### The Traffic of the "Nickel Plate."

The public and the railroad world are in the habit of looking upon the New York, Chicago & St. Louis Railway as a sort of poor relation of the Lake Shore & Michigan Southern, and it may surprise them when we say that the Nickel Plate has the denser freight traffic of the two. The report for the last year shows that its freight traffic was equivalent to the movement of 2,383 tons each way daily over the entire 512 miles of its road, while the Lake Shore's freight was equivalent to 2,132 tons each way daily over its 1,440 miles. The latter, it is true, has a long lead in passenger traffic, it being equal to 200 each way daily, against 122 on the Nickel Plate.

Moreover, the Nickel Plate, which lacks much of the perfection and completion of appliances which distinguish the Lake Shore, shows a higher cost of operation per unit of traffic, it is true, but an extremely low cost nevertheless. Assuming the proportion of the cost to receipts to be the same for both passengers and freight, which, however incorrect, will serve for a fair comparison between the two roads, we find the cost per ton-mile 0.374 cent on the Lake Shore and 0.435 on the Nickel Plate, and the cost per passenger-mile 1.456 cents on both roads. The Nickel Plate, be it observed, is the worse paid of the two, getting 1.76 cents per passenger-mile to the Lake Shore's 2.141, and 0.526 cent per ton-mile to the Lake Shore's 0.549.

The secret of it is that the Nickel Plate is all main line, while the Lake Shore is mostly branches, and these branches bring down the average density of traffic and bring up the average cost per unit of traffic. If we had the figures for the Lake Shore's main line separately, the comparison would be very different. The Nickel Plate has an average haul of 95 miles per passenger and 233 miles per ton of freight; the Lake Shore less than 47 miles per passenger and 174 miles per ton.

Naturally, an exceptionally large proportion of the Nickel Plate's business is through. Its report makes a separate statement of its earnings from through freight, and they amounted in 1896 to \$3,340,104, which is more than 71 per cent. of its total freight earnings.

If the Nickel Plate's freight had been given to the Lake Shore to carry, that road, owing to the lower cost of carrying freight on it, would have made apparently about \$534,000 more profit from it than the Nickel Plate made.

The latter's average freight train load was 230 tons; the Lake Shore's, 321 1/2. This is probably partly due to the larger proportion of westbound freight which the Lake Shore is able to secure. The Nickel Plate's earnings from eastbound through freight were 2 1/2 times those from westbound.

In the *Journal* of the German Railroad Union of April 3 last, Baron zu Weichs-Glon, the eminent Austrian economist, claims for Frederick List the credit of establishing the first railroad journal, not only in Germany but in the world (*überhaupt*); and he proceeds to give extracts from List's *Eisenbahn-Journal und National Magazin*, published in 1835. The railroad newspaper idea, however, List carried with him from America, with many of his other railroad ideas. His exile was certainly of immense value to Germany, though in quite another sense from that intended by the authority which banished him. As we write we have before us the first number of the *American Railroad Journal*, dated Jan. 2, 1832, and this periodical, instead of dying in infancy like List's journal, has continued down to this day, and until 1887 under the same name, while it now appears as the *American Engineer Car-Builder and Railroad Journal*, and proudly boasts of its sixty-sixth year on its cover. List lived in Pennsylvania, from 1825 to 1830, when this whole country was eagerly interested in improving its means of transportation. He published a German newspaper, was interested in the development of coal mines, and engaged in the building of a railroad which gave them an outlet to the Schuylkill Canal. But while living here he made plans for railroads in Germany and urged their adoption in writing. Later he visited both France and Germany, and in 1833 removed with his family to Leipsic, where he had been appointed American Consul by President Jackson. Thenceforward he was the most prominent and effective of the advocates of railroads in Germany, and succeeded in carrying to completion the Leipsic & Dresden Railroad, the first in Germany of any length. Many of the other lines proposed by him were built afterward, but he had little active part in the work, and he committed suicide, a disappointed man, in 1846. Now his wisdom and foresight in appreciating the value to Germany of the new means of transportation, and in discerning the direction of the chief traffic routes, are universally acknowledged in Germany, and if he were still living doubtless his breast would be covered with decorations.



which the larger sizes are compounded; the compound compressors are provided with an inter-cooler.

A peculiarity of these machines is that all the air valves are of the vertical gravity pattern and work without springs, while an improved form of piston ring prevents the leakage of air past the pistons, which are of the trunk pattern. There are no slides or stuffing boxes and all strains upon the rods are compression. The wrist pins are large and the upper wrist has renewable brass bushings. The crank shafts are of steel of large diameter, with cranks set at 180 deg. The main journals are long and lubricated by a chain oiler dipping in a reservoir. The cylinders and heads are water-

have allowed the use of their names to promote a questionable scheme have an immediate duty to perform.

The club was incorporated in New York early in 1896, the objects stated being fair-sounding but vague. The by-laws form an elaborate product of a mind evidently bent on securing sole power, and assurance of perpetuation of power, in the hands of the "Managing Governor." They are long, complicated, somewhat difficult of final interpretation and not unskillful, considering the end kept plainly in view. It becomes important to know, therefore, that the Managing Governor, C. E. Weisz, is not a railroad officer or a railroad employee; that while a conductor he was uncommonly active in endeavoring to convert the Order of Railway Conductors (an insurance society) into a strike organization; and that his last position in railroad service was with the New York, Ontario & Western Railway Company, from which he was discharged about eight or nine years ago. His associate in the board, J. E. Braze, was discharged by the same company in 1895.

Weisz is at present entirely occupied in the promotion of the two projects named above. He has a downtown private office in the Potter Building, New York, and employs men to travel and solicit large contribution to the support of the "Club" from the well-to-do among his "honorary members." Within a few weeks a wealthy director was on the point of contributing \$1,000 when a chance inquiry prevented this abuse of his generosity. There is evidence that the solicitors have met with success in many cases. The club has a house at 115 East Thirty-fourth street, New York City, which has been bought, furnished and heavily mortgaged. Liquors are sold there, and the register shows average daily visits of four members, the names of C. E. Weisz and a few other governors appearing with surprising regularity. We have not been able to learn of a reputable conductor in the vicinity of New York who avails himself of the club; from a large number of them the testimony is uniformly that it is unworthy. It evidently has but one object.

The "National Railway Protective League" is quite a different affair. In it, Weisz invites the membership of all railroad employees, for a fee of \$2 a year. The consideration offered to the employee is free preliminary advice and diagnosis by a local doctor when such employee meets with accident; also free preliminary counsel by a local lawyer in case of either accident or legal difficulty with the employing railroad company. It requires little effort of imagination to see in this simply an organized method of soliciting damage claims, and their prosecution for a contingent fee, a vicious practice with which all railroad officers are familiar.

#### TECHNICAL.

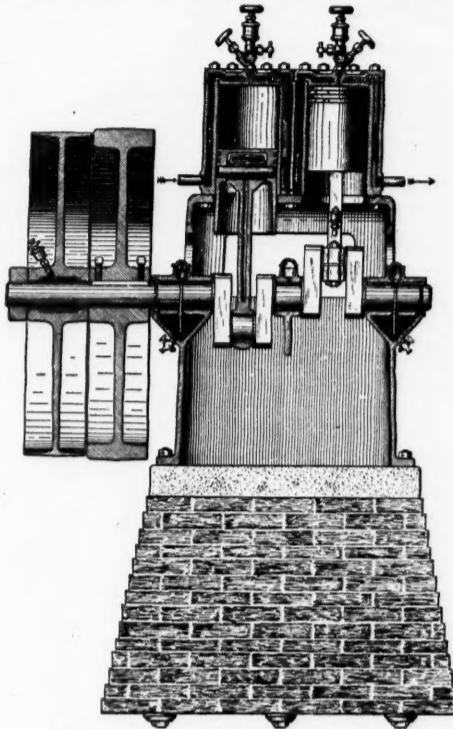
##### Manufacturing and Business.

The new boiler shop and other improvements of the works of the Dickson Manufacturing Co., at Scranton, Pa., are almost finished. With the addition of the new machinery, which is all of the latest design, the capacity of the shops will be greatly increased.

It is reported that J. D. Kirkpatrick, of Birmingham, Ala., is in the market for a 30-in. gage saddle-tank dummy locomotive and 100 tons of 40-lb. steel rails.

The American Brake Co. has received an order from the Oregon Short Line for brake equipment for 64 engines.

The Cooke Locomotive & Machine Co., of Paterson,



The Curt's Belt Driven Air Compressor.

jacketed. Automatic governors are used which can be set so as to work through a large range. These compressors are built in various sizes, the smallest having air cylinders 6 in. in diameter; the large compressors are horizontal and are used mostly about mines and quarries.

##### The New York Elevated on Grant Day.

We print below a table showing the number of passengers carried by the two western lines of the Manhattan Elevated System in New York City, April 27. These figures, it will be observed, are from 8 a. m. to 8 p. m., and they are for the Sixth avenue and Ninth avenue lines. The traffic on the Eastern Division of the road was only normal and the 24-hour record for the whole system, made Oct. 12, 1892, on the occasion of the Columbus celebration, was not broken. On that date in 24 hours the total number carried was 1,075,537. The record

##### PASSENGERS CARRIED ON THE SIXTH AND NINTH AVENUE LINES, MANHATTAN ELEVATED, APRIL 27.

Date.	8 to 9 a. m.	9 to 10.	10 to 11.	11 to 12.	12 to 1.	1 to 2.	2 to 3.	3 to 4.	4 to 5.	5 to 6.	6 to 7.	7 to 8 p. m.	Total.
Oct. 12, 1892 .....	28,777	47,624	37,642	25,633	29,084	26,183	26,759	32,118	34,106	39,007	49,016	31,619	397,568
April 27, 1897 .....	31,959	50,376	51,222	36,007	28,679	31,584	38,206	33,109	29,63	28,902	32,935	41,131	416,173
Increase, April 27, 1897 .....	3,182	2,752	13,580	374	.....	5,401	11,447	991	.....	.....	3,919	.....	8,615
Decrease, April 27, 1897 .....	.....	.....	.....	.....	405	.....	.....	.....	5,043	10,105	.....	17,488	.....

for 12 hours, however, was broken April 27. The greatest number of people carried by these two lines in any one hour was from 10 o'clock to 11 o'clock on the latter day, namely, 51,222, and it will be observed that in the two hours, from 9 o'clock to 11, 101,598 passengers were carried.

##### The Railway Conductors' Club of North America.

We have received many inquiries concerning the "Railway Conductors' Club of North America," and a lesser number concerning the "National Railway Protective League," both being promoted by some of the same individuals, and such information as we have is due to the officers and employees who are solicited to join them. This information is given as temperately as the apparent facts will permit, and with a sincere desire to avoid injurious reflections upon any worthy persons who may have connected themselves with either of these organizations.

Most railroad officers and many public men in this country have been, during the past year, invited to become "honorary" members of the "Club," without dues, and the printed list before us, headed by the name of William McKinley and including a brilliant list of well-known railroad officers, is evidence of a prevalent amiability and trustfulness. It is safe to say that the trust is misplaced and that those railroad officers who

N. J., has removed its New York office to the Havey Building, 26 Cortlandt street.

J. M. Hopkins, who has for a number of years been connected with Barney & Smith, car builders, Dayton, O., has organized the National Railway Specialty Co., with offices at 960 Old Colony Building, Chicago. The company will handle the Security car door.

The Standard Car Truck Co., Old Colony Building Chicago, has recently furnished trucks for the new 80,000-lb. Canadian Pacific freight cars. This company has also furnished the St. Paul & Duluth two heavy trucks for trial under locomotives.

William A. Parker, for 13 years with the Ingersoll-Sergeant Drill Co., now represents the Taylor Iron & Steel Co., of Highbridge, N. J., and the Spaulding & Jennings Steel Co., of Jersey City, N. J., in the West, with office at 1,524 Marquette Building, Chicago.

The new Pittsburgh Screw & Bolt Co., of Pittsburgh, Pa., has secured the former plant of the Westinghouse Machine Co., and it will be equipped for making nuts, bolts and screws.

The Consolidated Rail Joint Co. has purchased the mills of the Muskegon Iron & Steel Co., at Muskegon, Mich., and will shortly commence making a general line of track supplies. The mill at Chicago Heights will be closed when the new mill is put in operation.

The Savannah Locomotive Works & Supply Co., of

Savannah, Ga., has been incorporated by John J. McDonough, Thos. Ballantyne, W. C. McDonough, P. J. O'Connor and M. A. O'Byrne for the purpose of building, repairing and leasing locomotives and manufacturing and dealing in railroad material and supplies. The capital stock is \$100,000 with power to increase to \$200,000.

The Campbell & Zell Co., of Baltimore, Md., has received a contract for 1,204 H. P. of Zell water tube boilers for the Metropolitan cable road of Washington, D. C. This is the fifth order for boilers the company has received from the road.

The Fox Solid Pressed Steel Co. has removed its general office from Chicago to New York City.

Frank J. Sprague, who was recently appointed Consulting Engineer of the South Side Elevated road of Chicago, and awarded the contract for the motor truck equipment and controlling apparatus for the 120 passenger cars to be converted into motor cars, will sublet contracts probably early in June.

The Harrington Rail Bonding Co., of New York City, has been incorporated under the laws of New York State to deal in railroad supplies, with a capital stock of \$75,000. The directors are: Samuel H. Harrington, William R. Cook, John R. Matlock, Jr., and David Murray, of New York City.

##### Iron and Steel.

Prices of Bessemer iron have again declined. Sales for the month of April aggregated 119,500 tons.

The Penn Iron & Coal Co. has blown in its furnace at Canal Dover, O., which has been idle since last August.

The Northern Trust Co., of Chicago, has bought the plant of the Calumet Iron & Steel Co., at South Chicago, under a decree of foreclosure. The amount paid was \$374,088. The plant consists of 60 acres of land, a rolling mill and furnace.

No. 3 furnace of the Carnegie Steel Co., at Duquesne, Pa., was blown in on May 7. Nos. 1 and 2 furnaces are already in blast, and it is expected that No. 4 will be ready to be blown in some time during June.

The Pennsylvania Steel Co., Steelton, Pa., is making arrangements to start the Lochiel furnace, at Harrisburg, which has been out of blast for several years.

At the recent annual meeting of the Crane Iron Co., Catasauqua, Pa., Leonard Peckitt was elected President, and James M. Hodge, Secretary and Treasurer. Directors were elected as follows: Leonard Peckitt, R. F. Kennedy, F. G. Kennedy, Jr., R. E. Hastings, J. A. Harris, Jr., W. S. Pilling and George M. Troutman.

##### New Stations and Shops.

The Gulf, Colorado and Santa Fe is building a new iron and brick freight house and office at Dallas, Tex. The building consists of a brick office, 30 x 50 ft., with an attached warehouse, 40 x 208 ft. The F. L. Stevenson Contracting Co., of Dallas, has the contract for flooring, brick and stone work, and the Missouri Valley Bridge & Iron Works, of Leavenworth, Kan., for the ironwork. Bids have been invited for a new passenger station at Dallas, to be 75 x 110 ft. The building will be of brick and stone, two stories high.

The West Virginia, Central & Pittsburgh has given a contract to H. W. Blocher, of Cumberland, Md., to build a new roundhouse at the company's yards in Sinclairville, W. Va.

The Fremont, Elkhorn & Missouri Valley has called for bids for a new depot to be built at Deadwood, S. Dak. The building will be of stone and brick, part of it two stories high, the second floor being devoted to offices. It is proposed to have the building completed by fall.

The Chicago, Burlington & Quincy began excavating on May 3 for the foundation of the new passenger station to be built at Omaha, Neb. The foundations show that the building will be about 76 x 316 ft. in size. This part of the work is being done by the railroad company. Plans for the superstructure, which will be built under contract, are expected to be completed soon.

##### Automatic Couplers on the Southern Pacific.

In the annual report of the Southern Pacific we find that on the Pacific system the sum of \$99,254 was expended last year for automatic couplers; 4,834 freight cars were thus equipped. On the Atlantic properties 865 freight cars were equipped with automatic couplers at a cost of \$18,590. From these figures, the average cost per car on the Pacific system was \$20.50 and on the Atlantic system \$21.50.

##### The Economy of Preserving Timber.

In the annual report of the Southern Pacific Co. just published are some interesting figures as to the result of creosoting lumber. Figures are given of the diminished cost of maintaining timber trestles since they have been renewed with creosoted lumber and ballasted decks. In 1891 when the effect of these renewals had become apparent, the cost of maintaining the timber trestles on the Atlantic properties was \$1,212 per lineal foot. This fell to \$0,953 in 1893, and in 1896 it had fallen to \$0,346.

##### Decision in the Safety Valve Suit.

The suit of the Consolidated Safety Valve Co. against the Ashton Valve Co., of Boston, Mass., for infringement of a patent, was decided in favor of the defendant by Judge Colt in the United States Circuit Court at Boston, May 7. The valve in question was patented by George W. Richardson, Jan. 19, 1869. The Court held that the proper construction of the Richardson patent requires that the aperture at the ground joint caused by lifting the valve should always be greater than the

aperture for the exit of steam into the open air. The Ashton Valve Co.'s valve does not embody this construction.

#### THE SCRAP HEAP.

##### Notes.

The New York Central conductors who went to the Los Angeles convention started from Buffalo on May 5 in a special train.

The Illinois Railroad Commissioners have notified the railroads to make monthly inspections of interlocking switches, signals and apparatus, and report the results to the Commission.

The new Southern Freight Association has begun operations in Atlanta with a force of 33 clerks, which is 29 less than the force employed by the old Southern States Freight Association.

The Railroad Commissioners of New Hampshire have notified the railroads to place safety blocks in all frogs, switches and guard rails. The method of blocking is to be submitted to the Commissioners, and the work is directed to be done by Jan. 1, 1898.

A Chicago paper reports a great increase of activity in that city in the trade in railroad ties, due to the recent reduction in the price of steel rails and the consequent expansion of track-laying. The schooners which bring ties to Chicago from the timber regions along the lakes are having an active season for the first time since 1893. Vessels are making contracts which will keep them busy all summer.

Mr. P. J. Flynn has been elected Chairman and Secretary of the Colorado Passenger Association. This announcement, which we take from a Denver paper, would seem to indicate that the association named, which was reported as disbanded after the Supreme Court decision on the anti-trust law, has been re-established. The separation of the Utah associations from those of Colorado, which was indicated by the recent announcement of a separate commissioner for the Demurrage Bureau at Salt Lake City, seems to have been carried a step farther, and Mr. C. H. Griffin has taken Mr. Flynn's place as Chairman of the Utah Railway Association.

The Governor of Arkansas called a special session of the legislature this month for the purpose, chiefly, of having a discussion of a bill to establish a railroad commission, the proposition having failed at the regular session; but after long deliberation the Senate, on May 5, by a vote of 16 to 15, rejected the bill. It is possible that another bill will be brought forward in the House, and it is said that some of the Senators who voted in the negative on May 5 are in favor of some kind of a commission bill. Governor Pingree, of Michigan, has sent to the legislature a message urging an increase of the rate of taxation on railroad property. The legislature of Delaware, which is considering a bill to establish a state railroad commission, has received a petition in favor of it which is said to be 60 ft. long. The Massachusetts Legislature, after many days' discussion, has rejected a bill to authorize railroad companies to issue their own stock in exchange for the stock of subsidiary railroads absorbed.

#### Summer Courses of the Massachusetts Institute of Technology.

During the months of June and July, 1897, a supplementary series of courses of study will be given at the Institute. The courses for 1897 are a private undertaking on the part of certain instructors, and they will only be given when a minimum number of students have applied before a fixed date. A fee of \$25 for each course will be collected at the time fixed for closing the applications. For the courses in the chemical laboratories additional charges will be made for chemicals, gas, and apparatus, and a deposit of \$20 will be required to meet them. The Summer Courses are open to persons not students in the Institute of Technology, if they possess the necessary qualifications.

These Summer Courses include: Mechanical Drawing and Descriptive Geometry, Analytic Geometry, Shades and Shadows Elementary Design, Chemistry, Physics, Modern Languages, Mechanism and Shopwork.

In Mechanism the course will cover the work in the first and second terms of the second year in Mechanism and Gearing, but will not include the subjects of Machine and Cotton Machinery.

In shopwork, the courses are arranged to give the same instruction that is regularly taken by the students in Mechanical Engineering. On successful completion of the work of each course the applicant will be excused from the equivalent work in his department.

#### Fisherman's Paradise.

Mr. T. G. Winnett, General Passenger Agent, asks us to make it known that Northern Michigan has been rechristened in trout-stream water. East Tawas is the door or beginning of the trout streams of Northern Michigan, and from here north to Alpena the country is thickly studded with rivers whose waters are of exceptional purity and well stocked with many kinds of fish, such as black bass, rainbow trout, pike, pickerel, etc. Some of the smaller streams are within a short distance from Bay City, and none of them are so far away from Detroit that they cannot be reached in a few hours of travel over the Detroit & Mackinac Railway. The "fishing folder" which gives other information of value can be obtained by addressing J. D. Hawks, President, Detroit, Mich.

#### A New Vessel for the North German Lloyd.

On Sunday, of last week, the *Königin Luise*, the first of the six new steamers for the North German Lloyd to be completed, arrived in this port for the first time. She is a twin screw steamship of about 20,000 tons' displacement, with a draft of 28 ft., and 10,600 tons' register. She measures 550 ft. over all, and 55 ft. between perpendiculars, and has a beam of 66 ft. and a depth of 34 ft. Her engines are quadruple expansion, with cylinders 640 mm. (25.19 in.), 970 mm. (37.99 in.), 1,330 mm. (52.36 in.), and 1,920 mm. (76.59 in.) in diameter, by 1,400 mm. (55.11 in.) stroke, running from 77 to 78 turns a minute, and capable of developing 11,100 H. P. Steam is supplied

by 8 boilers, having a heating surface of 22,280 sq. ft., and working under a pressure of 220 lbs. per square inch. They burn about 130 tons of coal a day. The vessel is lighted by 750 incandescent lamps of 25 c. p., using an alternating current. This is the first German steamship, and we believe the first of any of the trans-Atlantic liners, to use a system of electric lighting by an alternating current. The steamship has a double bottom and is divided by transverse bulkheads into 13 watertight compartments. She was built by the Vulcan Shipbuilding Co., of Stettin, Germany.

#### The Third Rail Electric Road in Connecticut.

On May 10 an official test was given of the "electrified track" from Hartford to New Britain on the main line of the New England Railroad and from New Britain to Berlin on the New York, New Haven & Hartford. An electric motor-car, carrying officers of the New Haven and of the New England roads, with invited guests, was run from Berlin to New Britain and thence to Hartford. A third rail, laid between the two rails of the existing main track, is used to convey the power to the cars, the same as on the western portion of the Nantasket Beach line. On the New England portion of the line only one of the two main tracks is equipped. The Berlin-New Britain line is single track. The power station, which is located at Berlin, contains two batteries of five boilers each and a 1,200-H. P. cross-compound, Greene-Corliss condensing engine, which is direct connected to a generator of the G. E. type. There is room in the station for two engines besides the above, and when enlarged, there will be space sufficient for engines aggregating 10,000 H. P. At present five cars are ready for service, each 50 ft. long and similar to those in use at Nantasket Beach. The total length of line now supplied with the third rail is 13 miles and the run was made in about 18 minutes. The conductor rails are 93/4 in. lbs. to the yard, rolled in the form of a flattened A. These are laid in blocks of wood resting on ties, and each rail is bonded by two copper bonds. At stations the track has been fenced off so that no injury can be done, except by violation of the strict rules of the company. At the crossings, the current is carried by a cable in a wooden trough under the ties. Regular service will begin soon between Hartford and New Britain. No intermediate stops will be made, and only special tickets for the electric cars will be accepted. The rate of fare on the electric trains will be 10 cents one way, subject to change without notice. There will be no change in the existing steam passenger schedules, service or rates. The electric trains will leave Hartford and New Britain every 20 minutes. We intend to show engravings of the cars and some of the machinery in our next issue.

#### Standard Time in Europe.

Standard time is now used by the railroads of all the countries in Europe except Portugal, Spain, France, Ireland, Greece, Russia and Finland. Central European time is one hour faster than Greenwich time, and Eastern European is two hours faster. Central time, although not formerly called by that name, has been in use in Sweden since 1879, and the last nation to adopt standard time was Norway, two years ago. St. Petersburg time, which prevails in Russia, differs but one minute from Eastern European time. The principal countries of the Continent changed from their former standards to those here noted, mostly in 1891, 1892 and 1893, the example of the United States in 1883 having been the original incentive to the making of the reform. The 24-hour notation, for some time in use in Italy, has just been adopted by Belgium.

#### Railroad Exhibits at the Centennial Exhibition.

In our issue of Feb. 26 we described some of the special features of the exhibits to be made by the Southern railroads at the Tennessee Centennial Exposition. In that issue we called attention to the display to be made by the Nashville, Chattanooga & St. Louis, the Southern and the Georgia railroads, and the Plant system. It is proposed to make these separate exhibits educational bureaus, giving visitors specific data relative to all branches of industry through which the various lines pass. The train made up of Pullman sleepers, the same as that shown at the Chicago Fair, is exhibited, and beside this train is shown the first sleeping car built in America. The Iron Mountain and the St. Louis Southwestern railroads have their headquarters in a separate building near the Terminal Station, and here they show by photographs and otherwise the attractiveness of the section through which their lines pass. The Seaboard Air Line has built a car 28 x 90 ft., artistically decorated and lighted by electricity, in which is placed a very attractive exhibit.

#### New Burlington Passenger Cars.

The Chicago, Burlington & Quincy celebrated the spring change of time-table, at the beginning of this week, by putting on a complete train of new cars to run between Chicago and Kansas City on the schedule leaving Chicago at 5:30 p. m. The officers of the road gave the Chicago reporters a ride on the train, with a dinner, and on the return trip, by special train from Mendota, whisked them over the road to Western avenue (Chicago), 79 miles, in 79 minutes. The reporter of the Chicago *Inter-Ocean*, who was on the engine, says that the train went through Aurora at 70 miles an hour. There were several slight delays, including one due to weak track for about one mile, where repair work was in progress, so that the average speed on the open road must have been high. The reporters state that one stretch of 4.3 miles, from Sandwich to Plano, was traversed in three minutes, which is at the rate of 80 miles an hour. The new cars of the Kansas City train, except the sleeping cars, are of the standard canary color of the Burlington, with wide vestibules. The baggage cars have no platforms. The smoking cars have reclining chair seats upholstered in leather, and the regular reclining-chair cars, which are finished in mahogany, are upholstered in old gold silk velvet plush. The trains are fitted with apparatus for heating by hot water, and are lighted by electricity, but are also fitted with Pintsch gas apparatus.

#### New York State Canals.

The work of letting in water on the Erie and other state canals was in progress nearly all last week. It was hoped to have all the canal ready for navigation on May 8, but owing to some leaks this could not be done. There was a leak in the Erie Canal at Amsterdam, and the water had to be drawn from the levee, interrupting traffic. A delay of four days in opening the Champlain Canal was caused by a break on the Waterford level, some leaks on the northern section having also occurred. Plans and specifications for the balance of the work under the \$9,000,000 improvement scheme are being prepared by the State Department of Public Works, and it is expected to advertise for the bids for the work in two months.

#### New Pennsylvania Ferry at New York.

On Sunday next, May 16, the Pennsylvania Railroad will begin running its new ferry between Jersey City

and West Twenty-third street, New York City. This will make three connections between that road and New York. The long established Desbrosses street ferry lands at a point about one mile north of the Cortlandt street ferry, and Twenty-third street is about two miles north of Desbrosses street. Coincidently with this enlargement of the ferry service the company will establish a cab service in New York to be operated under its own control. There will be about 60 carriages, all new, and the business will be carried on as a branch of the railroad service, the cabs not bidding for miscellaneous traffic.

#### The John Scott Medal.

Notice is given that the Franklin Institute has recommended, subject to proper objection, the award of the John Scott Legacy Medal and Premium to Thomas R. Almond, of Brooklyn, N. Y., for his flexible metallic tube.

#### The Canadian-Niagara Power Company's Station.

April 30, the Canadian Niagara Power Co. began active work to develop power in accordance with the franchise granted by the Commissioners of Victoria Park on April 7, 1892. In April, 1896, the company applied for an extension of 18 months in which to commence the work, but this application met with severe protests and was denied. Under the provisions of the franchise the company must have 10,000 electrical H. P. developed by Nov. 1, 1898, and water connections made by that date for 25,000 H. P. At present there is a small local demand for power on the Canadian side, but the franchise allows a transmission of one-half of the developed power to the United States. The officers of the Canadian-Niagara Power Co. are: President, Col. Albert D. Shaw, of Watertown; Vice-President, Francis Lynde Stetson, of New York; Secretary-Treasurer, William B. Rankine, of New York. These gentlemen, with Charles J. Holman, of Toronto, Ont., form the Board of Directors.

#### A Big Flame.

A flume, 35 1/2 miles long, has been constructed to carry water from the mountains into the city of San Diego, Cal. The flume is of redwood, and required 9,000,000 ft. of lumber. In the course of the flume there are 315 trestles, the longest of which is 1,700 ft. and 85 ft. in height. The building of this trestle required 250,000 ft. of timber. The Sweetwater trestle is 1,200 ft. long and 85 ft. high. There are eight tunnels, the longest of which is 2,100 ft. Much of the lumber had to be hauled 700 to 800 ft. up the rocky sides of mountains.—*Northwestern Lumberman*.

#### LOCOMOTIVE BUILDING.

It is stated that three engines are being built for the Keokuk & Western by the Rogers Locomotive Co., of Paterson, N. J.

The Brooks Locomotive Works has received an order for one 10-wheel locomotive from the Mexico, Cuernavaca & Pacific, with 20 x 24 in. cylinders.

The Baldwin Locomotive Works are reported as building one locomotive for the Low Moor Iron Co., one for the Manistique Railroad, one for the Arizona & Southwestern, one for the Esquimalt & Nanaimo and four for the Detroit, Lima & Northern.

H. K. Porter & Co., of Pittsburgh, Pa., has received an order from the Russian government for two narrow-gauge passenger locomotives for a new railroad in Finland. The company is also building one locomotive for a railroad in San Salvador, Central America.

The Rogers Locomotive Co., of Paterson, N. J., has received an order from the Imperial Railways of China for eight standard gauge mogul engines for use on the Lu Han road. They will have 19 x 24-in. cylinders, 60 in. driving wheels and 42 in. tender wheels, steel-tired throughout, with cast centers and retaining rings; copper firebox, Nathan lubricator, Westinghouse air-brakes and American driver brakes.

The Dickson Mfg. Co., of Scranton, Pa., has received an order to build eight 10-wheel passenger locomotives for the Atchison, Topeka & Santa Fe after designs of Mr. John Player, Superintendent of Machinery of the road. The engines will be six-wheel connected, with 19 1/2-in. x 28-in. cylinders, extended wagon-top boiler, the smallest ring being 60 in., 73 in. drivers, with a rigid wheel base of 15 ft., and a total wheel base of 25 ft. 2 in., driving-wheel centers 66 in. and firebox 88 in. long, 41 in. wide. The company is also building a number of light locomotives and doing considerable repair work.

The Chicago, Rock Island & Pacific is building at the Chicago shops six 10-wheel locomotives, two being passenger engines, class 25-B, and four freight engines, class 25-A. The passenger engines will have 19 x 24-in. cylinders, 68 1/2 in. drivers, and a total weight of 137,000 lbs., with 107,000 lbs. on the drivers. The boilers will be of the extended wagon-top type with radial stays and will carry 180 lbs. steam pressure. The dimensions of the freight engines will differ from the passenger engines principally in that the drivers will be 64 1/2 in. in diameter, with a total weight of 130,000 lbs., and a weight on the drivers of 102,000 lbs. The cylinders and boilers are the same for both classes of engines. The boilers for the locomotives are now being built at the Brooks Locomotive Works. Mr. George F. Wilson's patent firebox will be used, which differs from the usual construction in that the inside firebox sheets are indented about the staybolts. This method of attaching the staybolts is now being used on 16 engines on the Chicago, Rock Island & Pacific, some of which have been in service 18 months. It is also being tried on a number of other Western roads. It has been found that with this construction there is no leakage around the staybolts, and that the staybolts are not so liable to break as when screwed into a flat sheet. The driving boxes, tumbling shafts, rocker arms and cross-heads of these engines will be cast steel. As cast steel driving wheel centers could not be obtained from the steel companies within the required time, cast iron will be used for these parts. The frames are now being forged at the railroad company's shops.

#### CAR BUILDING.

The St. Louis, Peoria & Northern is in the market for 300 box cars.

The Mobile & Ohio Railroad is reported to be in the market for 400 freight cars.

The Cudahay Packing Co., of Omaha, Neb., is about to order 200 refrigerator cars.

The Philadelphia & Reading Railroad is building 100 freight cars in its own shops.

The Carlisle Mfg. Co., of Carlisle, Pa., is building 50 cars for the Pennsylvania Coal & Iron Co.

The Chicago, Milwaukee & St. Paul will build at its Milwaukee shops 200 coal cars of 60,000 lbs capacity.

The Armour Packing Co. has placed an order with the Wells & French Co., of Chicago, for 350 freight cars.

The Welles & French Co. has received an order from the Chicago, Rock Island & Pacific for 50 refrigerator cars.

It is reported that the Texas Cattle Growers' Union, through G. W. Simpson, of Boston, Mass., will soon order 400 or 500 stock cars.

The Pullman Palace Car Co. recently received an order to build 50 freight cars for the San Francisco & San Joaquin and two sleeping-cars for the Missouri Pacific.

It is stated that the Borde Engineering Co., 402 Liverpool & London & Globe Bldg., New Orleans, La., is in the market for 40 or 50 second-hand standard-gage freight cars of 60,000 lbs. capacity.

The Mexican Central has placed an order with the St. Charles Car Co., of St. Charles, Mo., for 25 caboose cars. These will be equipped with link and pin couplers, Westinghouse air brakes, Player break beams and standard Mexican Central trucks.

The Laclede Car Co., of St. Louis, Mo., has received an order from the Baltimore & Northern Electric Railway Co. for 15 closed and 25 open cars.

#### BRIDGE BUILDING.

**Baltimore, Md.**—Mayor Hooper has signed the ordinance appropriating \$34,000 for a new bridge over Gwynns Falls, at Wilkins avenue.

**Bathurst, N. B.**—Plans have been invited by the Provincial Government for a new bridge across the Big River at this place, to be of steel with stone abutments. Particulars may be obtained from Mr. Emmerson, Commissioner of Public Works.

**Dedham, Mass.**—Special Commissioners S. N. Aldrich, of Marlboro; E. B. Bishop, of Haverhill, and H. C. Southworth, of Stoughton, filed their report, May 7 upon the petitions of the New England and New York, New Haven & Hartford railroads for the alteration of the grade crossings of Milton street, in Hyde Park, and Walnut, Mt. Vernon and East streets, in Dedham, and for a new highway crossing of the N. Y., N. H. & H. not at grade between Readville and Hyde Park stations. By the conditions of the report the New England will be connected with the Boston & Providence by tracks carried over the Boston & Providence by a five-track steel bridge, with masonry abutments to span four tracks and two platforms. The new street crossing will be carried over the tracks and land of the N. Y., N. H. & H. on a steel or iron bridge, carried on abutments and piers of masonry. The span of bridge will clear 14 tracks, and the roadway will be 26 ft. in the clear with sidewalks on each side. The street will be carried over Mother brook on a steel or iron bridge having a clear waterway of 40 ft. Hyde Park avenue will be carried under the tracks of the N. E. R. R. through a masonry arch or under an iron or steel bridge, either of which is to have a span of 60 ft. between abutments. Milton street will be carried over the tracks of the B. & P. on a steel bridge 60 ft. wide. Sprague street, also changed in its location and grade, is to be carried over the N. E. R. R. by a steel bridge with a wagon road 34 ft. wide; the approach on the north to be on a viaduct of steel and masonry. Walnut street, East Dedham, is to be carried over the railroad on an iron or steel bridge having a clear width of 57 ft. Mt. Vernon street is to be carried over the railroad by an iron or steel bridge with a clear width of not less than 52 ft. East street is to be carried under the tracks of the Dedham branch, the railroad going over it on a steel or iron bridge leaving a width of street between bridge abutments of 40 ft.

**Lewisburg, Pa.**—The people of Union County have been active in promulgating plans for the free bridge, at the foot of Market street, this place, to join this and Northumberland counties, and it is hoped that the commissioners of both counties will meet soon to complete details.

**London, Ont.**—The City Engineer has recommended that tenders be invited for a steel highway bridge across the river at the foot of King street. The structure will have a span of 163 ft., with a 305 ft. steel approach on the east side and one of 153 ft. on the west side.

**New York.**—The Mayor has accepted the bill providing for four bridges across the tracks of the New York Central and the New York & Putnam railroads, one at Walton avenue, one at Gerard avenue, one at River avenue and one at Fort Independence, the total cost of which shall not exceed \$150,000. Also the bill, providing for a bridge over the tracks of the Harlem Railroad at 153d street, the cost of which shall not exceed \$150,000; and the bill providing for viaduct or bridge across the tracks of the Harlem Railroad and the Port Morris branch from 163d street to the junction of Brook and Webster avenues at 165th street, the cost of which shall not exceed \$300,000.

**Perth Amboy, N. J.**—The Middlesex County Board of Freeholders is reported to have said that if that county spends any money this year it will be to build a bridge across the Raritan River to connect this place with South Amboy.

**Reading, Pa.**—The County Commissioners have adopted plans and specifications for two iron bridges which will be built in Berks County this summer, one across the west branch of the Perkiomen Creek and the other over Pine Creek, near Lohbachsville.

**Sunbury, Pa.**—The Court has confirmed the report for a bridge over Housell's Run, in West Chillisquaque township. The grand jury has approved the reports for the overhead bridge near the Cameron colliery in Shamokin, and for a bridge in Zerbe township.

#### MEETINGS AND ANNOUNCEMENTS.

##### Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

*Chestnut Hill*, quarterly, 1½ per cent., payable June 1.

*Chicago & Alton*, quarterly, 1½ per cent. on common and preferred stock, payable June 1.

*Cleveland & Pittsburgh*, quarterly, 1¾ per cent. on guaranteed stock, payable June 1.

*Manchester & Lawrence*, 5 per cent., payable May 1.

*Nassau & Lowell*, 4½ per cent., payable May 1.  
*Pennsylvania*, 2½ per cent., payable May 31.  
*Philadelphia, Germantown & Norristown*, quarterly, 3 per cent., payable June 4.

*Wilmington & Weldon*, 3½ per cent., payable May 12.

*West Chicago*, quarterly, 1½ per cent., payable May 15.

##### Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

*Burlington, Cedar Rapids & Northern*, annual, Cedar Rapids, Ia., May 25.

*Chateaugay*, annual, Plattsburgh, N. Y., May 29.

*Chicago, St. Paul, Minneapolis & Omaha*, annual, Hudson, Wis., June 5.

*Delaware, Maryland & Virginia*, annual, Georgetown, Del., May 26.

*Des Moines & Fort Dodge*, annual, Des Moines, Ia., June 3.

*Flint & Père Marquette*, annual, Saginaw, Mich., May 19.

*Lake Shore & Michigan Southern*, special, Cleveland, O., and Erie, Pa., May 20.

*Mexican Northern*, annual, 42 Pine street, New York, June 1.

*Missouri, Kansas & Texas*, annual, Parsons, Kan., May 19.

*New York Central & Hudson River*, special, Albany, N. Y., May 26.

*New York & Harlem*, annual, Grand Central Depot, New York City, May 18, and special meeting at the same time and place.

*Northern (New Hampshire)*, annual, Concord, N. H., May 27.

##### Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *American Society of Railroad Superintendents* will hold its next meeting at Nashville, Tenn., beginning Sept. 22.

The *American Society of Mechanical Engineers* will hold its semi-annual meeting at Hartford, Conn., May 25 to 28. For programme see issue of May 7.

The *Association of American Railway Accounting Officers* will hold a convention at Richmond, Va., on May 26, 1897.

The *Association of Railroad Claim Agents* will hold their next meeting at the Southern Hotel, St. Louis, May 26, 1897.

The *Association of Railway Claim Agents* will hold its convention at St. Louis, Mo., during the last week of May, 1897.

The *Canadian Electrical Association* will hold its convention at Niagara Falls, Ont., June 2, 3 and 4. Hotel Lafayette will be the headquarters of the association.

The *Master Car Builders' Association* will hold its annual convention at Old Point Comfort, Va., beginning June 8, 1897.

The *National Association of Local Freight Agents' Associations* will hold a convention at Washington, D. C., on June 8, 1897.

The *American Railway Master Mechanics' Association* will hold its annual convention at Old Point Comfort, Va., beginning June 15, 1897.

The *National Association of Car Service Managers* will hold a convention at Boston, Mass., on June 16, 1897.

The *Association of Railway Telegraph Superintendents* will hold a convention at Niagara Falls, N. Y., on June 16, 1897.

The *Ohio State Tramway Association* will hold its next meeting at Columbus, O., on June 15.

The *Train Despatchers' Association of America* will hold its tenth annual convention at Detroit, Mich., on June 22, 1897.

The *American Society of Civil Engineers* meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month, at 8 p. m.

The *Association of Engineers of Virginia* holds its formal meetings on the third Wednesday of each month, from September to May, inclusive, at 710 Terry Building, Roanoke, at 8 p. m.

The *Boston Society of Civil Engineers* meets at 715 Tremont Temple, Boston, on the third Wednesday in each month, at 7:30 p. m.

The *Canadian Society of Civil Engineers* meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday, at 8 p. m.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, N. Y., on the second Friday of January, March, May, September and November, at 8 p. m.

The *Civil Engineers' Club of Cleveland* meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

The *Civil Engineers' Society of St. Paul* meets on the first Monday of each month, except June, July, August and September.

The *Denv'r Society of Civil Engineers* meets at 3 Jacobson Bock, Denver, Col., on the second Tuesday of each month except during July and August.

The *Engineering Association of the South* meets on the second Thursday in each month, at 8 p. m. The Association headquarters are at The Cumberland Publishing House, Nashville, Tenn.

The *Engineers' and Architects' Association of Southern California* meets each third Wednesday of the month in the Hall of the Chamber of Commerce, Los Angeles, Cal.

The *Engineers' and Architects' Club of Louisville* meets in the Norton Building, Fourth avenue and Jefferson street, on the second Thursday each month at 8 p. m.

The *Engineers' Club of Cincinnati* meets at the rooms of the Literary Club, No. 25 East Eighth street, Cincinnati, O., on the third Thursday in each month, at 7:30 p. m. Address P. O. Box 383.

The *Engineers' Club of Columbus, (O.)*, meets at 12½ North High street, on the first and third Saturdays from September to June.

The *Engineers' Club of Minneapolis* meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

The *Engineers' Club of Philadelphia* meets at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month, at 8 p. m., except during July and August.

The *Engineers' Club of St. Louis* meets in the Missouri Historical Society Building, corner Sixteenth street and Lucas place, St. Louis, on the first and third Wednesdays in each month.

The *Engineers' Society of Western New York* holds regular meetings the first Monday in each month, except in the months of July and August, at the Buffalo Library Building.

The *Engineers' Society of Western Pennsylvania* meets at 410 Penn avenue, Pittsburgh, Pa., on the third Tuesday in each month, at 7:30 p. m.

The *Montana Society of Civil Engineers* meets at Helena, Mont., on the third Saturday in each month, at 7:30 p. m.

The *New England Railroad Club* meets at Westover Hall, Bromfield street, Boston, Mass., on the second Tuesday of each month.

The *New York Railroad Club* meets at 12 West Thirty-first street, New York City, on the third Thursday in each month, at 8 p. m.

The *North-West Railway Club* meets on the first Tuesday after the second Monday in each month, at 8 p. m. in the place of meeting alternating between the West Hotel, Minneapolis, and the Ryan Hotel, St. Paul.

The *Northwestern Track and Bridge Association* meets at the St. Paul Union Station on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m.

The *Railway Signalling Club* will meet on the second Tuesday of the months of January, March, May, September and November, in Chicago.

The *St. Louis Railway Club* holds its regular meeting on the second Friday of each month, at 3 p. m.

The *Southern and Southwestern Railway Club* meets at the Kimball House, Atlanta, Ga., on the third Thursday in January, April, August and November.

The *Technical Society of the Pacific Coast* meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.

The *Western Foundrymen's Association* meets in the Great Northern Hotel, Chicago, on the third Wednesday of each month. A. Sorge, Jr., 1533 Marquette Building, Chicago, is secretary.

The *Western Railway Club* meets in Chicago on the third Tuesday of each month, at 2 p. m.

The *Western Society of Engineers* meets in its rooms on the first Wednesday of each month, at 8 p. m., to hear reports, and for the reading and discussion of papers. The headquarters of the Society are at 1736-1739 Monadnock Block, Chicago.

##### Chicago Electrical Association.

A regular meeting of the Chicago Electrical Association was held Friday evening, May 7. Mr. C. H. Thordarson, an electrical manufacturer, presented a paper entitled, "Direct Current Transformers." The Association will have a banquet May 21.

##### Freight Claim Association.

This Association held its annual meeting at Nashville, Tenn., May 5 and 6. The officers elected for the ensuing year are: John Nichol (L. V.), President; W. P. Taylor (R. F. & P.), Richmond, Va., Secretary. The next annual meeting will be held in Chicago.

##### Western Foundrymen's Association.

The annual meeting of the Western Foundrymen's Association will be held Wednesday evening, May 19, at the Great Northern Hotel, Chicago. The officers of the association for the ensuing year will be elected, after which a paper will be presented by Mr. H. F. Frohman, on "Foundry Facings."

##### St. Louis Railway Club.

A regular meeting of the St. Louis Railway Club will be held at 3 p. m. this afternoon at the Southern Hotel. The papers to be read are "Methods and Standards of Maintenance of Way," by Mr. W. M. Duane, Engineer of Maintenance of Way, Cleveland, Cincinnati, Chicago & St. Louis; "Scientific Study of Hot Boxes," by Mr. M. P. Cook, Manager Cook Cooler Co., Flint, Mich. A discussion will be held on the paper "Air Brakes and Why it is Important to Maintain Them," which was read at the April meeting by Mr. G. W. Rhodes, Superintendent of Motive Power of the Chicago, Burlington & Quincy.

##### Engineers' Club of Cincinnati.

At the April meeting of the club Mr. S. Whinery read a paper which was a discussion of the water supply problem for Cincinnati, in reply to criticisms of the plans proposed by the Engineer Commission in its report to the Board of Administration, contained in papers read at the March meeting. A complimentary farewell dinner was given to Mr. Whinery at the club-rooms on the evening of April 29 on account of his departure to New York City as a future home and place of business.

##### New England Railroad Club.

A regular meeting of the New England Railroad Club was held at Westover Hall, Boston, on Tuesday evening, April 13. The paper read at the March meeting of the club by Mr. George H. Frazier on "Uniform Basis for Locomotive Performance Sheets for New England Railroads" was discussed. A paper was then read by Mr. Coffin, Assistant Superintendent of the expert department of the Galena Oil Works, on the subject, "To What Extent is it Economy to Limit the Consumption of Oil Per Engine Mile?" This paper was discussed at length by Messrs. A. Griggs, George A. Coolidge, James E. Sague, Daniel A. Smith, Henry Bartlett, Prof. C. F. Allen and A. J. Desoe.

##### Western Society of Engineers.

The Western Society of Engineers held a regular meeting, Wednesday evening, May 5, at the Technical Club, Chicago. Mr. Staunton B. Peck, Chief Engineer of the Link Belt Machinery Co., read a paper on "Rope Transmission." Those taking part in the discussion which followed were: Messrs. John Walker, John C. Bley, B. B. Carter and A. M. Feldman. Mr. Walker, who is connected with the Walker Mfg. Co., has had considerable experience with rope transmission and was able to give some valuable information.

At the next meeting of the Society, which will be held May 26 at the Technical Club, Mr. Charles B. Burton will lecture on the "X-Rays," and will also show the apparatus for the production of the rays.

##### Southern & Southwestern Railway Club.

A regular meeting of the Southern & Southwestern Railway Club was held at the Kimball House, Atlanta, Ga., on April 8. A report of the committee on the Revision of the Master Car Builders' Rules was presented and accepted. A report on the subject "Painted Versus Planished Iron for Jackets" was submitted by the committee, but the discussion was postponed until the August meeting of the club. Reports were also submitted on the subjects "Air Brakes on Old and New Rolling Stock" and "Qualifications of Successful Railroad Men." The subjects for discussion and committees' reports at the next meeting of the club, to be held August 12, will be "Trains Parting," "Exhaust Pipes," "Painted Versus Planished Iron for Jackets" and "Car Roofs."

##### Civil Engineers' Society of St. Paul.

The club held its last regular meeting at St. Paul, Minn., Monday evening, May 3. A paper, by President Hilgard, on "Some Standard Plans for Girder Bridges on the Northern Pacific Railway System," was presented. The paper set forth the advantages of the standard 100-ft. plate-lattice girder, designed by Mr. Hilgard, which has been in use for the past two years. The method of

replacing (in the space of about four hours) the old structure on temporary foundations with the new girder bridge on concrete foundations previously built was definitely described. The pound prices for bridge complete, contracted for in 1895, averaged 3½ cents; in 1896, about 3 cents, and will not exceed 2½ cents the present year. Mr. Hilgard's scheme of complete standard plans of uniform size, blue-printed from photographic negatives, for bidders, inspectors and office use, furnishes in abundance, at small cost, the details so necessary to definite treatment of this class of work. The meeting adjourned to the first Monday in September.

#### Engineers' Club of St. Louis.

The last regular meeting of the club was held at 1600 Lucas place, St. Louis, Wednesday evening, May 5. A paper by Mr. W. A. Layman, entitled "Long-Distance Electric Power Transmission," was read. The writer briefly reviewed the methods of electric power generation and the different systems of electric transmission, and showed how the two and three-phase electric currents are peculiarly adapted to long distance transmission, illustrating his remarks by means of charts and apparatus. He described in detail the recent installations at Sacramento and Fresno, Cal.; Telluride, Colo., and Salt Lake City, Utah. Lantern slides showing views of these plants were exhibited. The discussion which followed was participated in by Messrs. Bryan, Flad, Bausch and Laird. Following this paper, Mr. C. G. Barth made an address on "Columns." He showed the result of eccentric loading, and gave a new formula which he had derived for use in the designing of columns. He exhibited curves showing how his formula compared with those in common use. On motion Mr. Barth was requested to put his remarks in writing with a view to publication.

#### American Street Railway Association.

The sixteenth annual meeting of the American Street Railway Association will be held in Convention Hall, Niagara Falls, N. Y., Oct. 19 to 22, inclusive. A building 120 x 154 ft. is being erected for the exhibition of street railroad supplies and for the meetings. If the certificates for 100-single fare tickets are presented to the clerk at Niagara Falls, those attending the convention will secure their return ticket for one-third the price of the round trip fare. Mr. T. C. Pennington, Secretary-Treasurer, 2020 State street, Chicago, will give full information in regard to accommodations and other particulars. Papers will be read on the following subjects:

Municipal Ownership of Street Railways.  
Modern Electric Railways; their Construction, Operation and Disadvantages.  
Application of Electricity to Railroads now Operated by Steam Power.  
The Best Method of Settling Damage Cases, and the Prevention of Accidents by the Use of Fenders and Otherwise.  
Producer Gas for Use in Street Railway Power Houses and Gas Engines.  
Storage Batteries for Street Railways.  
Discipline of Employees.  
Long Distance Transmission and the Use of Multiphase Current for Ordinary Street Railways.

#### The National Association of Railway Surgeons.

The National Association of Railway Surgeons held their tenth annual convention in Chicago, commencing May 4 and closing May 6. The attendance of members was nearly 400. On Wednesday Dr. J. B. Murphy, Chicago, entertained the members with an excursion on Lake Michigan.

The exhibits made by manufacturers and others were in the same building, on the floor below the convention hall, and were more extensive than those of any previous convention.

The next convention will be held at Toronto, Canada. The following officers were elected for the ensuing year: President, Dr. George W. Ross, Richmond, Va.; Treasurer, Dr. E. R. Lewis, Kansas City; Secretary, Dr. L. J. Mitchell, Chicago.

Among the papers presented and discussed were the following:

"Relief and Hospital Departments," by Dr. Frank H. Caldwell, Waycross, Ga. Discussion opened by Drs. W. B. Outten and George Cheeke.  
"Relation of Railway Companies to State Boards of Health," by Dr. G. P. Conn, Concord, N. H.  
"An Exhibition of the Various Devices for the Determination of the Color Sense of Railway Employees," by Dr. C. W. Tangeman, Cincinnati, O. Discussion opened by Drs. John F. Fulton and J. A. White.  
"The Beneficial Influence Exercised by Railway Hospital Associations Upon the Morals of Employees," by Dr. Geo. W. Hogeboom, Kansas City, Mo.  
"Observations Upon and Reasons for a More Complete Physical Examination of Railway Employees," by Dr. Henry F. Hoyt, St. Paul, Minn. Discussion opened by Dr. W. D. Middleton.

#### Traveling Engineers' Association.

The committee on the subject for discussion at the next annual meeting, viz., "Is the brick arch an economical adjunct to a locomotive," desires answers to the following questions:

Are you using brick arches in your fireboxes?  
What proportion of the engines are so equipped?  
(a) Also, the style and classes of engines?  
Do you find any perceptible benefits or economy in the use of the arch in any one type of engines over another? If so, state classes?  
(a) Also, in engines equipped with different style stacks?  
(b) Please give data.  
Do you use arch pipes, or are the bricks supported from the side sheets?  
Do you experience any difficulty in preventing the banking of the arch with cinders?  
How are your arches located with reference to the bottom flues?  
(a) Is the same position followed in all classes of fireboxes?  
What is the average life of your arch in the different classes of engines?  
(a) Also, the cost of same for material and labor?  
Have you made any tests to ascertain what benefit, if any, is derived from the use of the arch?  
(a) Is there any economy in the consumption of coal?  
(b) Any increase in the life of flues?  
(c) Is it a preventive of black smoke?  
In the use of brick arches do you experience any difficulties with cracking of side or door sheets?  
What percentage of the area of the firebox does the arch occupy?  
(a) Its location.  
Do you use any different method of firing engines with and without ashes?

It is hoped that the members will all give this subject careful consideration and furnish the committee with full report. Replies should be sent to Mr. J. Donovan, 31 Congress street, St. Albans, Vt.

#### Iron and Steel Institute (British).

As previously announced, the annual meeting of the Institute was held at the Institution of Civil Engineers, Great George street, Westminster, on Tuesday and Wednesday, May 11 and 12, 1897, commencing each day at 10:30 o'clock a. m. The programme of arrangements was:

Monday, May 10.—9:30 p. m., Reception by Sir David and Lady Dale, at Royal Institute of Painters in Water Colors, Piccadilly.

Tuesday.—9:30 a. m., Meeting of Council; 10:30 a. m., General Meeting, at which the Bessemer and gold medal for 1897 was presented to Sir Frederick A. Abel, Bart., K. C. B. The President-elect (Mr. Edward P. Martin) delivered his inaugural address, and a selection of papers was read and discussed. 7 p. m., annual dinner, at which His Highness the Duke of Teck was the guest of the evening.

Wednesday.—10:30 a. m., General Meeting.

The following is a list of papers read and discussed:

The Permeability of Steel-Making Crucibles. By Prof. J. O. Arnold and F. K. Knowles.

The Practice of the Combined Open-Hearth Process of Bertrand and Thiel. By E. Bertrand.

The Agricultural Value of Sulphate of Ammonia from Blast Furnaces. B. F. J. R. Carulla.

The Specific Heat of Iron. By Prof. W. N. Hartley, F. R. S. Charging Open-Hearth Furnaces by Machinery. By Jeremiah Head.

The "Weardale" Reheating Furnace. By H. W. Hollis.

The Effect of Phosphorus on Cold Shortness. By Baron Hanns Junptner von Jonstorff.

The Determination of Hardening and Carbide Carbon By Baron Hanns Junptner von Jonstorff.

Malleable Cast Iron. By G. P. Royston.

Carbon Changers Connected with Malleable Cast Iron. By G. P. Royston.

Microscope Accessories for Metallographers. By J. E. Stead, Member of Council.

Central Blast Cupolas. By T. D. West.

semer & Lake Erie, at Conneaut, in charge of the movement of the company's lake vessels.

—Mr. A. J. Ratcliff has been appointed Traveling Passenger Agent for the Union Pacific, with headquarters at Salt Lake City, to succeed Mr. D. S. Taggart, resigned. Mr. A. D. Stiles was appointed to this position a short time ago, but declined on account of other duties.

—Mr. Pierre Jay has been elected President of the Second Avenue Railroad Company of New York to succeed Mr. John D. Crimmins, resigned. Mr. Crimmins was elected temporary President after the reorganization of the company. Mr. Jay is also Assistant Secretary and Assistant Treasurer of the St. Paul & Duluth Railroad.

—Mr. James M. Schryver, formerly Assistant General Passenger Agent of the Baltimore & Ohio, has been appointed General Passenger Agent of that road with headquarters at Baltimore to succeed Mr. Charles O. Scull, resigned. Mr. Schryver has been in the service of the Baltimore & Ohio since 1873; he has been Assistant General Passenger Agent for the last eight years.

—Major Henry O'Hara died at his home at St. Louis, Mo., on April 30. Major O'Hara was at one time connected with the car service of the Cairo Short Line, and later became President of the Lansburg Brake Co. He was also interested in the Hicks Stock Car Co. Major O'Hara is said to have been the first to introduce the use of southern pine for the heavy parts of freight cars.

—Mr. W. J. Cooke, Vice-President of the McGuire Mfg. Co., Chicago, has been chosen President of the Scoville Place School, a college preparatory and finishing school for girls, at Oak Park, near Chicago. One sentence in the published curriculum is so practical and suggestive that it may be imagined to have come from the new President: "Special attention is paid to the correct and elegant use of the English language, both in speaking and writing." It is safe to say that most college-bred young men and women do not use correct English.

#### ELECTIONS AND APPOINTMENTS.

*Atchison, Topeka & Santa Fe.*—A. F. Mack has been appointed Traveling Freight Agent, with headquarters at Pittsburgh, Pa. J. J. Warner has been appointed Freight and Passenger Agent, with headquarters at Oakland, Cal.

*Baltimore & Ohio.*—G. A. Cartwright has been appointed Assistant General Freight Agent of the Pittsburgh Division and branches and the lines west of the Ohio River, with headquarters at Pittsburgh. O. A. Constance, formerly Division Freight Agent at Pittsburgh, has been transferred to Columbus, O., as Division Freight Agent of the Central Ohio and Midland divisions, to succeed Mr. Cartwright. The office of Division Freight Agent at Pittsburgh has been abolished. G. W. Spencer has been appointed Trainmaster of the Chicago Division between Chicago Junction, O., and Whiting, Ind., with headquarters at Garrett, Ind., to succeed W. J. Sharp, promoted. T. W. Barrett has been appointed Chief Train Dispatcher of the Chicago Division, to succeed Mr. Spencer. J. P. White has been appointed Traveling Freight Agent in the territory west of Herring Run and east of Washington Junction, Md., to succeed W. A. Wallace, transferred.

*Buffalo, Rochester & Pittsburgh.*—F. P. McCloskey has been appointed Agent at Big Run, Pa., to succeed C. L. McCloskey. The appointment took effect May 10. F. B. Dawson has been appointed Agent at Rockton, Pa., to succeed F. P. McCloskey, transferred. The appointment took effect May 11.

*Canadian Pacific.*—C. Sheehy, District Passenger Agent at Detroit, Mich., having resigned, that office has been abolished, and the territory over which he had jurisdiction will hereafter be in charge of J. F. Lee, General Agent, Passenger Department, with office at Chicago.

By a rearrangement of the divisions of this road, there will be in future two divisions instead of five, as heretofore. Thomas Tait, formerly Assistant General Manager, has been appointed Manager of the Eastern Division, consisting of the lines east of Fort William, with headquarters at Montreal. The office of Assistant General Manager has been abolished. William Whyte, formerly General Superintendent of the Western Division, has been appointed Manager of the Western Division, consisting of the lines west of Fort William, with headquarters at Winnipeg, Man.

*Central of New Jersey.*—At the annual meeting of the stockholders, held in Jersey City on May 7, the former Board of Directors was re-elected.

*Chicago, Burlington & Quincy.*—F. C. Matthews has been appointed Traveling Passenger Agent at Denver, Col., to succeed A. B. Schmidt. J. L. Hohl has been appointed Traveling Freight Agent, with headquarters at St. Joseph, Mo. W. S. Leighty has been appointed Live Stock Agent at St. Joseph.

*Chicago, Milwaukee & St. Paul.*—W. F. Dudley has been appointed Assistant General Auditor, with office at Chicago, to succeed R. S. Dousman, appointed Freight Auditor, to succeed Mr. Dudley. F. A. Nash has been appointed General Western Agent at Omaha, Neb.

*Delaware & Hudson Canal Co.*—At the annual meeting of the stockholders, held on May 11, the present Board of Directors was re-elected with the exception that R. Somers Hayes was elected to succeed Cornelius Vanderbilt, who had declined to stand for re-election.

*Denver, Cripple Creek & Southern.*—The officers of this company, recently incorporated in Colorado, are: President, Charles T. Case; Secretary and Treasurer, Charles E. Funk; Auditor, Charles Meierhoffer; Chief Engineer, W. C. Teller; Traffic Manager, George S. Freeman.

*Dillsburg & Mechanicsburg.*—At the annual meeting of stockholders, held recently at Mechanicsburg, Pa., the following Directors were elected: Thomas B. Kennedy, President; Edward B. Watts, Henry McCormick, J. H. Bosler, Wm. Penn Lloyd, Joseph Milleisen and Christian Bender, all of Dillsburg.

*Eastern in New Hampshire.*—At the recent annual meeting at Portsmouth, N. H., officers for the ensuing year were elected as follows: President, Moody Currier; Treasurer, S. C. Eastman; Secretary, John Sise.

*Franklin, Somerset & Kennebec.*—The incorporators of this new company in Maine have organized by electing the following Directors: Leonard Atwood, W. H. Ambler and W. B. Hewett, Philadelphia; Herbert H. Rice and Frank W. Butler, Farmington, Me.; George H. Stinchfield, Farmington Falls, and H. B. Prescott, New Sharon. President, Leonard Atwood; Treasurer, W. H. Ambler.

—Mr. H. B. Cole, formerly Traveling Freight and Passenger Agent of the Colorado Midland, has resigned to accept a similar position with the St. Louis & San Francisco, with headquarters at Denver, Col., to succeed Mr. Frank McGinnis, resigned.

—Mr. George Tener, who for a number of years has been connected with the Oliver Iron & Steel Co., has been appointed General Agent of the Pittsburgh, Bes-

**Grand Trunk.**—R. Patterson has been appointed Master Mechanic of the Western Division, with headquarters at Fort Gratiot, Mich., to succeed H. Roberts, retired. J. A. Slack, Assistant Master Mechanic, Western Division, with headquarters at Battle Creek, Mich., has resigned, and that office has been abolished.

**Lake Shore & Michigan Southern.**—At the annual meeting of stockholders held at Cleveland on May 5, Messrs. W. K. Vanderbilt, Samuel F. Barger, H. McK. Twombly and Charles M. Reed were re-elected Directors to serve for three years.

**Louisville & Nashville.**—R. D. Stern has been appointed Traveling Freight Agent, with headquarters at Evansville, Ind., to succeed G. W. French, resigned. C. F. Barrett has been appointed Traveling Freight Agent, with headquarters at Cincinnati, O., to succeed E. B. McSheehy, resigned.

**Mexican Central.**—At the annual meeting, held at Boston, Mass., May 5, the following directors and officers were elected: Isaac T. Burr, Sebastian Camacho, Benjamin P. Cheney, Levi Z. Leiter, Pablo Martinez, Del Rio, James C. Melvin, E. Rollins Morse, Hiram R. Nickerson, John B. Paine, Charles E. Perkins, Joseph Richardson, Albert A. Robinson, William Rotch, Alden Speare, Robert R. Symon, Joseph H. White and George B. Wilbur. President, A. A. Robinson; Vice-President, Robert R. Symon; Vice-President and Chairman Finance Committee, E. Rollins Morse; Clerk and Comptroller, J. T. Harmer; Treasurer, and Transfer Agent, C. A. Browne; General Manager H. R. Nickerson; Auditor, W. A. Frost, and Assistant Treasurer, Jay A. Hendry.

**Michigan Central.**—At the annual meeting of stockholders held at Detroit, Mich., May 6, the present officers and Board of Directors were re-elected for the ensuing year.

**Missouri, Kansas & Texas.**—The following appointments took effect May 1: M. Sweeney, formerly Superintendent of Transportation, is General Superintendent; E. M. Collins, Car Service Agent. All employees heretofore reporting to the Superintendent of Transportation now report to Mr. Collins. The office of Superintendent of Transportation has been abolished.

**Nashville & Knoxville.**—At the annual meeting of stockholders, held recently at Lebanon, Tenn., the present Board of Directors was re-elected.

**New Albany Belt & Terminal.**—George T. Jarvis has been appointed Receiver, to succeed Messrs. J. McLeod, F. W. Tracy and S. M. Felton, resigned. Mr. Jarvis has made the following appointments: Auditor, C. W. McGuire; Treasurer, J. S. Wright; General Freight Agent, R. A. Campbell; Superintendent, E. Holbrook; Master Mechanic, F. C. Cleaver.

**New York, Chicago & St. Louis.**—At the annual meeting of stockholders held at Cleveland, O., May 5, the present Board of Directors was re-elected. Officers were elected as follows: Chairman of the Board, William K. Vanderbilt; President, S. R. Callaway; Secretary and Treasurer, Ally Cox.

**Oconee & Western.**—The office of M. V. Mahoney, General Freight and Passenger Agent, has been removed from Hawkinsville, Ga., to Mechanic, with headquarters at Dublin, to succeed J. A. Long, resigned.

**Phillips & Rangeley.**—At the annual meeting at Phillips, Me., May 6, directors were elected as follows: Calvin Putnam and Fletcher Pope, of Danvers, Mass.; A. B. Gilman and George M. Goodwin, of Haverhill; Hartley H. Field, Joel Wilbur, J. H. Byron, Sydney G. Haley and F. N. Beal. The following officers were elected: President, Calvin Putnam; Treasurer and General Passenger Agent, Hartley H. Field; General Manager, Fletcher Pope.

**St. Louis & San Francisco.**—Messrs. Richard Olney and Henry K. McHarg have been elected Directors, to succeed William T. Hart, deceased, and Gen. Horace Porter, resigned.

**St. Louis Southwestern.**—At the annual meeting of the St. Louis Southwestern of Texas and of the Tyler Southeastern, held recently at Tyler, Tex., the present officers of both companies were re-elected.

**Silverton.**—Alexander Anderson has been appointed Superintendent, with headquarters at Silverton, Col., to succeed Moses Liverman, resigned. Frank P. Thornton has been appointed Secretary and Auditor, to succeed Mr. Anderson.

**South Branch.**—The directors of this company, which proposes building a railroad, 12 miles long, in McKean County, Pa., are: Herbert C. Rich, Cattaraugus, N. Y., President; H. Clarence Rich, Buffalo, N. Y.; L. G. Willson, W. L. Andrews, F. E. Hinman, E. E. Keith, all of Gardeau, Pa.; C. R. Rich, Cattaraugus, N. Y.

**Staten Island.**—The directors of the road, which is leased to the Staten Island Rapid Transit, have elected the following officers: President, J. Frank Emmons; Vice-President, James M. Fitzgerald; Secretary, Edward Curry.

**Union Pacific.**—E. E. Elser has been appointed Traveling Passenger Agent, with headquarters at Los Angeles, Cal., to succeed G. F. Herr. Matt Clarke has been appointed Contracting Freight Agent, with office at San Francisco, to succeed F. H. Plaisted, previously Freight Traveling Agent, transferred. Charles H. Marshall has been appointed General Eastern Agent, with headquarters at New York City, a newly created office.

#### RAILROAD CONSTRUCTION, Incorporations, Surveys, Etc.

**Alexandria, Junction City & Shreveport.**—This company was incorporated in Arkansas on May 4, with a capital stock of \$3,000,000. The officers are: President, C. E. Neely, St. Louis; Vice-President, J. W. Brown, Camden; General Manager, C. C. Henderson, Junction City. All are connected with the Arkansas Southern. A local newspaper reports that the object of this company is to build a road from the southern terminus of the Arkansas Southern direct to the Gulf of Mexico. The Arkansas Southern now extends from Eldorado, Ark., south 27 miles to Junction City on the Louisiana State Line.

**Denver, Cripple Park & Southern.**—This company has been incorporated in Colorado, with a capital stock of \$1,000,000, by Charles L. Case and George S. Freeman, of Colorado; Charles E. Funk, of Chicago; Samuel L. Blake, of Michigan, and Frank W. Corrigan, of St. Louis. The object of the company is to give an outlet to the Freshwater mining district, which is about 25

miles west of Cripple Creek. The present plan is to build a road from Garo to Cripple Park, in the Freshwater district, and thence to Cripple Creek, making a connection with one of the railroads entering that town. From Cripple Creek the line is to be continued to Canon City. The officers of the company are given in another column.

**Erie & Central New York.**—It is expected that this road, which was partly built several years ago between Cortland and Cincinnatus, N. Y., about 16 miles, all in Cortland County, will be completed. Mr. N. A. Bundy, President of the Otselic Construction Co., of Brooklyn, which has the general contract for the road, has recently inspected the line, and it is believed that the construction company will soon sublet the contract for its completion. It is proposed by the construction company to obtain the complete right of way and to sell \$25,000 of bonds of the road to citizens of the district through which it will pass before subletting any contracts. An ultimate extension of the road from Cincinnatus southeast to Hancock or Deposit is contemplated. W. D. Tidtsdale, Cortland, N. Y., is President of the company, and J. S. Bull, of Cortland, is General Manager.

**Lewisburg & Buffalo Valley.**—This company was incorporated in Pennsylvania, on May 10, with a capital stock of \$30,000. It is proposed to build a road about 15 miles long in Union County, Pa., from Lewisburg northeast to a tract of timber land recently purchased by Monroe H. Kulp & Co., in Lewis Township. The incorporators and directors are: M. H. Kulp, Shamokin, Pa., President; G. Gilbert Kulp and Daniel C. Kaseman, Shamokin, Pa.; George C. Rohrbach, L. T. Rohrbach and H. L. Landau, Sunbury, Pa., and M. H. Barr, Milton, Pa.

**Macon, Dublin & Savannah.**—This road is to be extended from its present terminus at Dublin, Ga., southwest to Lyons, about 50 miles. Surveys for the proposed line have recently been made under Superintendent Dunn. The route will pass within a short distance of Bruton and within two miles of Blackville. The road is expected to enter Savannah by connection with the Georgia & Alabama at Lyons. The road now extends from Macon to Dublin, 54 miles.

**Mexican Land, Navigation & Railway Co.**—This company has recently been organized at the City of Mexico, Mex., with a capital stock of \$1,000,000 by Santiago Mendez, Sub-secretary of Communications, H. P. Stuart, representing the London contracting firm of S. Pearson & Son and Manuel Gama. It is proposed to build a railroad from some point on the National Tehuantepec north to a point in the state of Vera Cruz, probably at Paso de San Juan, a total distance of about 40 km. (about 25 miles). The Mexican government has granted a subsidy of about 400,000 acres of land, on which it is proposed to settle European and other colonists.

**Mississippi, Colesburg & Manchester.**—Bids are being asked for building this proposed road in northeastern Iowa. The line will run from Colesburg, Delaware County, Ia., in a general southeasterly direction, through Petersburg and New Vienna to Dyersville, Dubuque County, there connecting with the Chicago Great Western. The road will be about 16 miles long. Contractors are invited to correspond with W. C. Kirchheek, Secretary, Colesburg, Ia.

**Ohio River & Charleston.**—Grading for a distance of 10 miles from Blacksburg has been completed on the branch being built from Blacksburg southwest to Gaffney, S. C., and it is proposed to begin tracklaying at once. Work has already been begun on the bridge across the Broad River. J. B. Ross, of Blacksburg, has the contract for the first 10 miles of the road.

**Peoria & St. Louis.**—Dwight L. Wing, the general contractor for this road, which is proposed to connect Springfield and Peoria, Ill., has sublet a contract to S. A. Campbell & Co., of St. Louis, for 55 miles of the road from Sherman, a point on the Chicago & Alton, about seven miles north of Springfield, north to Pekin, on the Illinois River, a few miles south of Peoria.

**Restigouche & Western.**—The charter for this proposed railroad in New Brunswick has recently been obtained by Messrs. Malcolm & Ross, contractors, and it is expected that the road will now be built. The line is to extend from Campbelltown, on the Bay of Chaleurs in the northern part of New Brunswick, southwest about 110 miles to St. Leonard's on the St. John River. Campbelltown is a station on the Intercolonial. St. Leonard's is directly across the river from Van Buren, Me., the proposed ultimate northern terminus of the Bangor & Aroostook, which now reaches Caribou, 20 miles south.

**Rio Grande, Sierra Madre & Pacific.**—Eighty-five miles of track have been laid on this road, in Mexico, from Ciudad Juarez, which is opposite El Paso, Tex. The road will extend to Casas Grandes, Mex., 157 miles, passing within seven miles of Corralitos. The road is being built by the Sierra Madre Construction Co., which has at present 325 men employed. Beside this company there are two sub-contractors at work, each employing about 125 men. It is believed that the road is being built upon a cash basis, as there are no bonds or other evidences of indebtedness outstanding against it. Up to April 1, \$335,000 had been expended. The character of the work is generally light. The bridging is all bent and pile trestles. J. Fewson Smith, of the railroad, is Chief Engineer, with headquarters at Ciudad Juarez. The New York office of the Sierra Madre Construction Co., of which A. Foster Higgins is President, is at 54 Exchange Place.

**Santa Fe, Prescott & Phoenix.**—An extension of this road is proposed from Prescott, Ariz., southeast about 25 miles into the Big Bug Mining District, in the valley of Big Bug Creek. It is expected that the citizens of Prescott will give bonus for building the new line.

**Sierra (Cal.)**—Grading has been completed for a distance of seven miles out of Oakdale, Cal., and rails for 35 miles of track are at Oakdale. A contract has been given for the first 40 miles, and it is expected that the road will be completed to Montgomery's, 20 miles from Oakdale, before July 1, and to Sonora, about 40 miles distant, before December. The road is to run from Oakdale, Stanislaus County, northeast to Sonora, Tuolumne County, thence southeast to Coulterville, Mariposa County, with a branch from Sonora to Angel's Camp and other mining towns in that district. The total length is 124 miles. Sidney D. Freshman, Oakdale, Cal., is President of the company.

**Southern Illinois Coal.**—This company has recently been incorporated in Illinois to build a railroad from some point in Williamson County, Ill., in a general southwesterly direction through Williamson, Union and Alexander counties to a point on the Mississippi River in Alexander County, with branches to coalfields in Jackson, Williamson and Johnson counties. The capital stock is \$50,000. The incorporators and Board of Directors are: R. Kelley, F. W. Johnston, W. L. Stocker and

A. G. Brown, of St. Elmo, and J. H. Atterbury, of Mt. Vernon. The principal office will be at St. Elmo, Ill.

**Texarkana & Shreveport.**—Grading has been completed for 12 miles into Caddo County, La., on the proposed southern extension of this road, and rails have been bought for a part of this distance. The intention of the company is said to be to extend the road from its present southern terminus at Kiblah, Ark., in a general south-easterly direction to Black River, Concordia County, La., about 150 miles, passing through Shreveport and Conshatta. The road now extends from Texarkana, Ark., southeast 34 miles to Kiblah.

**Wadley & Mt. Vernon.**—It is proposed to extend this road from Rixville, Ga., to Fitzgerald, in the southern part of the state. The extension will be about 75 miles long and will pass through Southeastern Georgia. Connection will be had at Fitzgerald with the Georgia & Alabama. The road is now in operation between Wadley and Rixville, 29 miles, connecting with the Central of Georgia and Louisville & Wadley at Wadley.

#### Electric Railroad Construction.

**Asheville, N. C.**—A company is being formed at Asheville to build a suburban electric railroad of about five miles in length. The present Street Railway Co. is interested in the enterprise, and it will practically be an extension of the line. Additional rolling stock will be bought and extra power put in.

**Baltimore, Md.**—Stockholders of the Baltimore Traction Co. and of the City & Suburban Railway Co. will meet separately May 22 to consider the proposed plan for consolidating the two roads.

Mr. George Webb, General Manager of the Falls Road Electric Railway Co., has made application to Mayor Hooper for a permit to construct the proposed railroad on the Falls road and on various streets authorized by ordinance.

**Belair, Md.**—Work was begun last week on the electric railroad on the Belair road, which it is proposed to complete to Putty Hill early in July.

**Boston, Mass.**—The West End Street Railway Co. is making preliminary arrangements to erect a power-house at a cost of about \$400,000 on its recently purchased land at Boylston street and the Charles River Park.

**Bucyrus, O.**—The Buckeye Traction Co. has filed a \$3,000 bond with the County Commissioners, binding the company to begin work on the proposed Galion & Bucyrus electric railroad before June 1, and to have it finished by Jan. 1, 1898.

**Camden, N. J.**—Surveyors have commenced work locating the lines for the new car barn of the Camden & Suburban Railway Co. on a triangular plot of ground owned by the company on Winsor street. The barn will be 150 ft. long by 100 ft. wide. Smaller buildings will be erected on the remainder of the ground.

**Cleveland, O.**—A petition has been filed with the County Commissioners asking permission to give the Cleveland & Eastern Railroad Co. a franchise over the Cleveland & Mayfield plank road for 50 years. The railroad company is to pay the plank road company, which has a perpetual franchise for its planks, \$400 per year and not run a longer train of freight cars than five cars.

**Collegeville, Pa.**—A petition has been presented requesting the Council to permit the Traction Company to extend its line through the borough of Collegeville. The terms of the petition require that the Traction Co. should pay the borough of Collegeville \$2,500 for the right of way, one-fifth of the cost of grading, one-fifth of the cost of macadamizing, \$50 per year for five years and \$100 a year thereafter.

**Colorado Springs, Colo.**—Work was begun April 20 in grading East Boulder street for the new street car line. This work may have been done simply to keep alive the franchise which was recently granted.

**Cripple Creek, Col.**—The Cripple Creek Mail states that Mr. L. D. Ross, of Cripple Creek, has made a purchase of rails from the Illinois Steel Co. for a part of the new road. The first part of the road to be built will be between Cripple Creek and Victor, and it is expected that cars will be in operation between these points by September next. The total proposed length of the road will be 21 miles, and the cost of construction is estimated at \$500,000. Mr. Ross states that \$200,000 is now in deposit in the Cripple Creek banks to start the work.

**Dayton, O.**—The Dayton, Spring Valley & Wilmington Transit Co. proposes to build a line from Dayton through Bellbrook, Spring Valley and New Burlington to Wilmington, a distance of about 35 miles. The right of way has been secured, and contracts will, it is stated, soon be let. President, Wallace Berryhill; Vice-President and General Manager, J. M. Wilson; Secretary, John H. Racer; Superintendent and Engineer, F. H. Talbot, 1926 West Lake street, Chicago, Ill.

**Kirkwood, Mo.**—The Suburban Railway Co. has been granted a franchise for an electric road in Kirkwood.

**Lancaster, Pa.**—The Pennsylvania Traction Co. has awarded to Thos. A. Anderson & Co. of Lancaster, the contract for erecting a 300-H. P. Allis-Chalmers engine and a 200-K. W. Westinghouse generator in the power station in Lancaster. The same firm has also been awarded the contract for furnishing and erecting two 100-H. P. boilers for the Traction Company's plant.

**Long Branch, N. J.**—The Atlantic Highlands, Red Bank & Long Branch Railway Co. has filed the required bond for the construction of its road, which is to be in operation by July 1.

**Mansfield, Mass.**—Surveys have been made by the Mansfield & Norton Electric Railway Co., for an electric road between the points mentioned in the title, a distance of about 6 miles. The towns are now connected by the N. Y., N. H. & H. Railroad.

**Massillon, O.**—The right of way has been obtained for the Massillon & Dalton Electric Railroad. No contracts have been let and the surveys have not been made. C. F. Reinold, West Brookfield, O., is interested.

**Riverhead, L. I.**—The consent of the Commissioner of Highways has been given for the construction of the Riverhead, Quogue & Southampton Railroad, which proposes to build a section of the Quogue road this summer. Consent was given upon the condition that the road be completed within one year.

**Rockland, Me.**—The directors of the Rockland, Thomaston & Camden Street Railway Co. have voted to extend the tracks of the Highland branch on the Old County road.

**Salem, Mass.**—Charles Odell, of Salem, and C. F. Dennis, of Newburyport, Mass., are among the incorporators of the Plum Island Electric Street Railway Co., which proposes to build a line 4 miles in length.

**West Newton, Pa.**—Council has granted a franchise to the Second Avenue Traction Co., with a proviso that work must be begun within six months and completed within a year. This line will make connection with Pittsburgh without change of cars.

#### GENERAL RAILROAD NEWS

**Central of New Jersey.**—The earnings for March and for the three months ended March 31 have been reported as follows:

March:	1897.	1896.	Inc. or Dec.
Gross earn.....	\$893,214	\$934,149	D. 40,835
Oper. expen.....	633,800	661,470	D. 27,670
Net earn.....	\$259,414	\$272,579	D. \$13,165
<i>Three months:</i>			
Gross earn.....	\$2,597,369	\$2,765,166	D. \$167,797
Oper. expen.....	1,826,780	1,923,337	D. 96,557
Net earn.....	\$770,589	\$841,829	D. \$71,240

**Central Washington.**—In the case of the Knickerbocker Trust Co., *et al.*, against this company, the Northern Pacific Railroad Co. and the Farmers' Loan & Trust Co., Judge Hanford, of the U. S. Circuit Court, at Spokane, Wash., has given a decree of foreclosure. The suit was brought to foreclose a mortgage made to the Farmers' Loan & Trust Co. in September, 1888, to secure payment of \$2,156,000, 50-year 6 per cent. bonds, and which was transferred to the Knickerbocker Trust Co., as trustee for the bondholders, on April 19, 1895. Default in the payment of interest on these bonds was made in September, 1893. The Central Washington was leased to the Northern Pacific in 1888. On Nov. 17, 1894, the Farmers' Loan & Trust Co. took possession of the road, upon whose application it was operated by the Receivers of the Northern Pacific under a lease, which was afterward terminated by order of the Court, and a sole receiver was permanently appointed. The Court has directed Master in Chancery W. J. C. Wakefield to sell the property within 60 days from June 7, 1897, if by that time principal and interest of the bonds, amounting to \$2,696,000, with accruing interest and other costs, be not fully satisfied.

**Chicago & Northern Pacific.**—A meeting of the first mortgage bondholders, who deposited bonds under the agreement of Dec. 5, 1893, will be held in New York City, May 20, to take action on a plan of reorganization recently prepared. The plan provides for the organization of the Chicago Terminal & Transfer Railroad Co., which will acquire the property of this company and of the Chicago & Calumet Terminal, a belt line operated in connection with the Chicago & Northern Pacific, and an issue of \$16,590,000, first mortgage 50-year 4 per cent. gold bonds (only \$12,742,000 to be issued on reorganization), \$17,000,000 of preferred stock and \$13,000,000 of common stock. The holders of the United States Trust Co.'s certificates, issued for the bonds deposited, will receive 40 per cent. in new bonds, 50 per cent. in preferred stock and 40 per cent. in common stock. All the securities of the Chicago & Calumet Terminal Co. are held by the Managers of the Northern Pacific reorganization, who have agreed to deliver them, together with the \$2,500,000 of bonds of the Chicago & Northern Pacific to the new Chicago Terminal & Transfer Railroad Co. The Northern Pacific managers will receive in return securities of the new company equal in amount to those to be delivered under the plan of reorganization. The Chicago & Northern Pacific is a terminal company at Chicago.

**Colorado Midland.**—An order for a foreclosure sale of the entire property of this company has been given by the United States Circuit Court, at Denver, Colo., under a mortgage of \$2,000,000 held by the Central Trust Co. of New York. The sale is to be made at Colorado City, and is expected to take place some time during June. The company was chartered in November, 1883, and the road was opened for traffic Oct. 15, 1888. The entire capital stock of the company is owned by the Atchison, Topeka & Santa Fe. A Receiver was appointed on May 1, 1894. The main line extends from Colorado Springs, Colo., to Newcastle, Colo., 224 miles, with 120 miles of branches and leased lines.

**Duluth & Winnipeg.**—Henry S. Butler, Commissioner under the U. S. Circuit Court at Madison, Wis., will sell the terminals of the company at Superior and the ore docks on Allouez Bay under foreclosure at Superior, Wis., May 15. The property is mortgaged to the Safe Deposit & Trust Co., of Maryland.

**Erie.**—The earnings for the three months ending March 31 have been reported as follows:

	1897.	1896.	Inc. or Dec.
Gross earn.....	\$6,258,599	\$6,187,311	I. \$71,288
Oper. expen.....	4,834,313	4,510,928	I. 313,385
Net earn.....	\$1,404,286	\$1,676,383	D. \$272,097
Other income.....	36,011	6,718	I. 29,293
Total income.....	\$1,440,297	\$1,683,101	D. \$242,804
Fixed charges.....	2,124,829	1,741,290	I. \$383,539
Deficit.....	\$684,532	\$58,189	I. \$26,343

**Hildago & Northeastern.**—Dispatches from Pachuca, Mex., announce that this road has been sold to a syndicate of English capitalists, represented in Mexico, by W. L. Pritchard and T. M. Crawford. The sole owner of the road was Gabriel Mancera. It is expected that the road will be extended to Tuxpan and Tampico.

**Illinois Central.**—The earnings for March and for the nine months ending March 31 were as follows:

March:	1897.	1896.	Inc. or Dec.
Gross earn.....	\$1,307,201	\$1,724,829	I. \$82,372
Oper. exp.....	1,254,596	1,209,692	I. 44,904
Net earn.....	\$55,605	\$515,137	I. \$37,468
<i>Nine months:</i>			
Gross earn.....	\$16,938,238	\$17,029,573	D. \$91,295
Oper. exp.....	11,670,307	11,159,322	I. 511,85
Net earn.....	\$5,267,731	\$5,870,211	D. \$602,480

The gross earnings for April, 1897, are estimated at \$1,567,757, as against \$1,638,741 in April, 1896, an estimated decrease of \$71,004.

**Lebanon Springs.**—On application of the Hilton Bridge Co., of Albany, N. Y., Elathan Sweet was appointed Receiver of this company, on May 4, by Justice Fursman, of the Supreme Court of New York, to succeed the late William D. Reynolds. Pell W. Foster, one of the principal owners of the road, has been made trustee for the bondholders. The road, which extends

from Chatham, N. Y., to Bennington, Vt., 57 miles, went into the hands of a receiver in 1880 and was sold under foreclosure June 12, 1885. It was purchased by a syndicate of bondholders who transferred it to the New York, Rutland & Montreal, April 1, 1886. On Feb. 27, 1888, the road again went into the hands of the Receiver of the Lebanon Springs Railroad Co.

**Middle Tennessee & Alabama.**—This road was sold under foreclosure at Fayetteville, Tenn., May 5, to J. W. Dickson, Receiver of the St. Louis, Chicago & St. Paul for \$150,000. The decree was granted by Judge Lurton, March 8, on application of the Central Trust Co., of New York, as stated in these columns March 19. The line is projected from Decatur, Ala., to Shelbyville, Tenn., 78 miles, and has been completed from Bonneville, Tenn., to the Alabama state line, 34 miles. The company was organized in 1893 as successor to the Decatur, Chesapeake & New Orleans.

**New York Central & Hudson River.**—The earnings for the three months and for the nine months ended March 31 were as follows:

Three months:	1897.	1896.	Inc. or Dec.
Gross earn.....	\$10,133,425	\$10,239,911	D. \$100,486
Oper. expen.....	6,886,976	7,29,328	D. 142,352
Net earn.....	\$3,246,449	\$3,254,583	D. \$8,134
First charges.....	2,635,863	2,641,528	D. 8,665
Profit.....	\$610,583	\$610,055	I. \$531
Dividend.....	1,000,000	1,000,000	.....
Deficit.....	\$389,414	\$389,945	D. \$531
<i>Nine months:</i>			
Gross earn.....	\$33,071,888	\$34,299,313	D. \$1,220,425
Oper. expen.....	22,381,063	23,318,487	D. 837,424
Net earn.....	\$10,690,825	\$11,673,826	D. \$983,001
First charges.....	7,900,097	7,925,830	D. 22,933
Profit.....	\$2,790,828	\$3,150,796	D. \$360,068
Dividend.....	3,000,000	3,000,000	.....
Deficit.....	\$209,272 (Surp.)	\$150,796	I. \$360,068

**Norfolk & Western.**—The earnings for March and for the six months ending March 31 were as follows:

March:	1897.	1896.	Inc. or Dec.
Gross earn.....	\$938,515	\$967,309	D. \$28,794
Oper. expen.....	619,234	776,626	D. 157,392
Net earn.....	\$319,281	\$190,683	I. \$128,598
<i>Six months:</i>			
Gross earn.....	\$5,370,054	\$5,645,746	D. \$27,692
Oper. expen.....	3,836,673	4,384,072	D. 547,399
Net earn.....	\$1,533,381	\$1,261,674	I. \$271,77

**Northeastern of Georgia.**—The time for payment of the back rent for this road by the lessees, E. A. Richards & Co., of New York, expired on May 6, and on that day Governor Atkinson, of Georgia, took formal possession of the property. R. K. Reeves has been named as State Agent to take charge of the road, subject to orders from the Executive Department. It is expected that the road will be sold on June 24 by Governor Atkinson under a special act of the Georgia Legislature. The upset price has been set at \$287,000, the amount of the state bonds on the road. The road extends from Athens north to Lula, Ga., 140 miles.

**Ohio Valley.**—John Roberts and James Quarles, Commissioners, have advertised the sale of this road to take place at Henderson, Ky., on June 3. The sale will be made in consequence of a decree of foreclosure given in the U. S. Circuit Court for the Sixth District in the case of the Central Trust Co., of New York, against the road. The upset price will be \$1,050,000 and a deposit of \$100,000 will be required from all bidders.

**Pennsylvania.**—The earnings of the lines directly operated east of Pittsburgh and Erie, for March and for the three months ended March 31, were as follows:

March:	1897.	1896.	Inc. or Dec.
Gross earn.....	\$5,064,732	\$5,253,922	D. \$189,200
Oper. expen.....	3,411,869	3,661,309	D. 216,500
Net earn.....	\$1,619,923	\$1,592,623	I. \$27,300
<i>Three months:</i>			
Gross earn.....	\$14,306,739	\$14,893,839	D. \$587,100
Oper. expen.....	10,267,227	11,134,427	I. 867,200
Net earn.....	\$4,039,512	\$3,759,412	I. \$280,100

**On all lines west of Pittsburgh and Erie the March gross earnings decreased \$138,600, and the net earnings increased \$20,500; gross earnings for three months decreased \$650,600 and net earnings increased \$74,400. The gross earnings of the entire system for March decreased \$327,800, and the net earnings increased \$47,800; gross earnings for three months decreased \$1,237,700, and net earnings increased \$354,500.**

**Port Arthur, Duluth & Western.**—The first mortgage bondholders, who virtually control this road, their interest having been in default for several years, have offered it for sale, through the Toronto General Trusts Co. There are \$1,497,324 first mortgage bonds and 10,640 shares of the capital stock. This move has been caused by the general depression in the mining industry of Northern Minnesota, which district is reached by this road. The road extends from Port Arthur, Ont., at the head of Lake Superior, southwest 87 miles to the Minnesota boundary line at Gun Flint Lake, and from that point six miles into Minnesota to the Gun Flint Lake iron mines, which is its present terminus. The company holds a charter for an extension of the line to Ely, Minn., 45 miles, through the Mesaba iron ore district.

**Southern Pacific.**—The earnings of this company, including leased and proprietary railroad and steamship lines, for the year ended Dec. 31, were as follows:

	1896.	1895.	Inc. or Dec.
Gross earn.....	\$48,666,667	\$50,457,025	D. \$1,790,358
Oper. expen.....	31,962,207	33,242,436	D. 1,280,229
Net earn.....	\$16,704,460	\$17,214,589	D. \$510,129
Other income.....	2,229,645	2,376,885	D. 147,240
Total income.....	\$18,931,105	\$19,591,474	D. \$657,369
Charges, taxes, etc....	17,144,551	17,406,252	D. 261,701
Surplus.....	\$1,789,554	\$2,185,222	D. \$395,668

The company has changed its fiscal year so that it will end hereafter on June 30.

**Savannah, Florida & Western.**—Arrangements have been made with the New York Security & Trust Co. to refund the Atlantic & Gulf 7 per cent. consolidated mortgage bonds which will mature July 1 next. These bonds will either be paid at maturity or they may

be exchanged for first mortgage gold bonds of the Savannah, Florida & Western. These latter bonds are a part of an authorized issue \$6,500,000 first mortgage 50-year gold bonds, of which only \$4,056,000 have been issued; they will mature April 1, 1934.

**Utah Central.**—This road was sold under foreclosure at Salt Lake City, Utah, May 8, to Graff & Dittmeyer, representing New York bondholders, for \$277,000. The road is narrow-gage and extends from Salt Lake to Park City, Utah, 38 miles, with branches from Park City eastward seven miles, and from Salt Lake City six miles. James McGregor and Clarence Cary were appointed Receivers Nov. 27, 1893.

#### TRAFFIC.

##### Traffic Notes.

The conference between the Kansas State Railroad Commissioners and the railroad men, concerning the proposed readjustment of rates on grain to the seaboard, is announced to be held on May 20.

The Erie Canal was opened on May 8, but business was dull and the Boat Owners' Association held a meeting and reduced rates on grain and some other commodities. The wheat rate agreed upon a few weeks ago, 3½ cents a bushel, was reduced to 3 cents, and the corn rate to 2½ cents.

The amount of freight carried to and from Lake Superior through the United States and the Canadian canals at Sault Ste. Marie during the month of April was 199,503 tons, the westbound movement being 78,709 and the eastbound 120,794. Only about 5½ per cent. of this freight passed through the Canadian canal.

A petition before the Canadian Parliament for the passage of a law to compel the free transportation of bicycles is said to have 20,000 signatures. Why the promoters of the bill stopped with so small a number is something we cannot understand. There are at least 200,000 "cyclists" in the United States who would gladly have given them the benefit of their signatures and their influence.

The Interstate Commerce Commission, sitting in Philadelphia, has this week resumed its hearings on the complaint of the New York merchants concerning freight rates on grain from the West to New York, continuing the investigation begun in New York and reported in the *Railroad Gazette* of March 26. The claimants presented a statement, compiled from statistics furnished by the Joint Traffic Association, showing that the receipts of freight at New York from the West in 1896 were only 11 per cent. greater than in 1895, while at Philadelphia the increase was 23 per cent. and at Baltimore 84. It was also shown that on the Pennsylvania Railroad alone the increase in eastbound freight to New York was 9 per cent., to Philadelphia 24 per cent., and to Baltimore 55 per cent. The Baltimore & Ohio showed increases as follows: To New York, 12 per cent.; to Philadelphia, 13 per cent., and to Baltimore